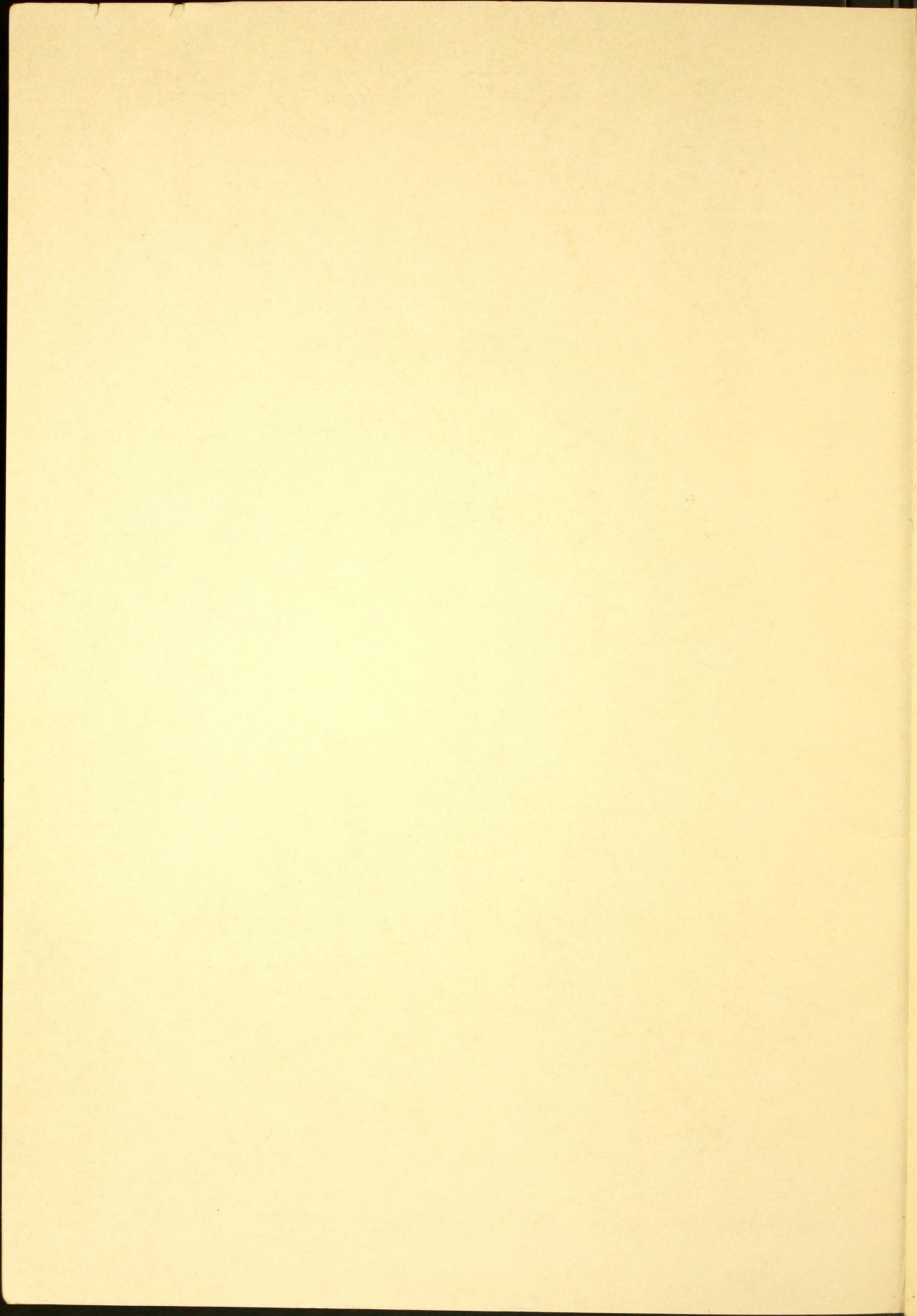


85-2.

Boilers





INTERNATIONAL

ECONOMY *SMOKELESS* *BOILERS*



INTERNATIONAL HEATER COMPANY

Makers of Heating Apparatus

UTICA, NEW YORK

NEW YORK
Fisk Bldg., Broadway and 57th Street

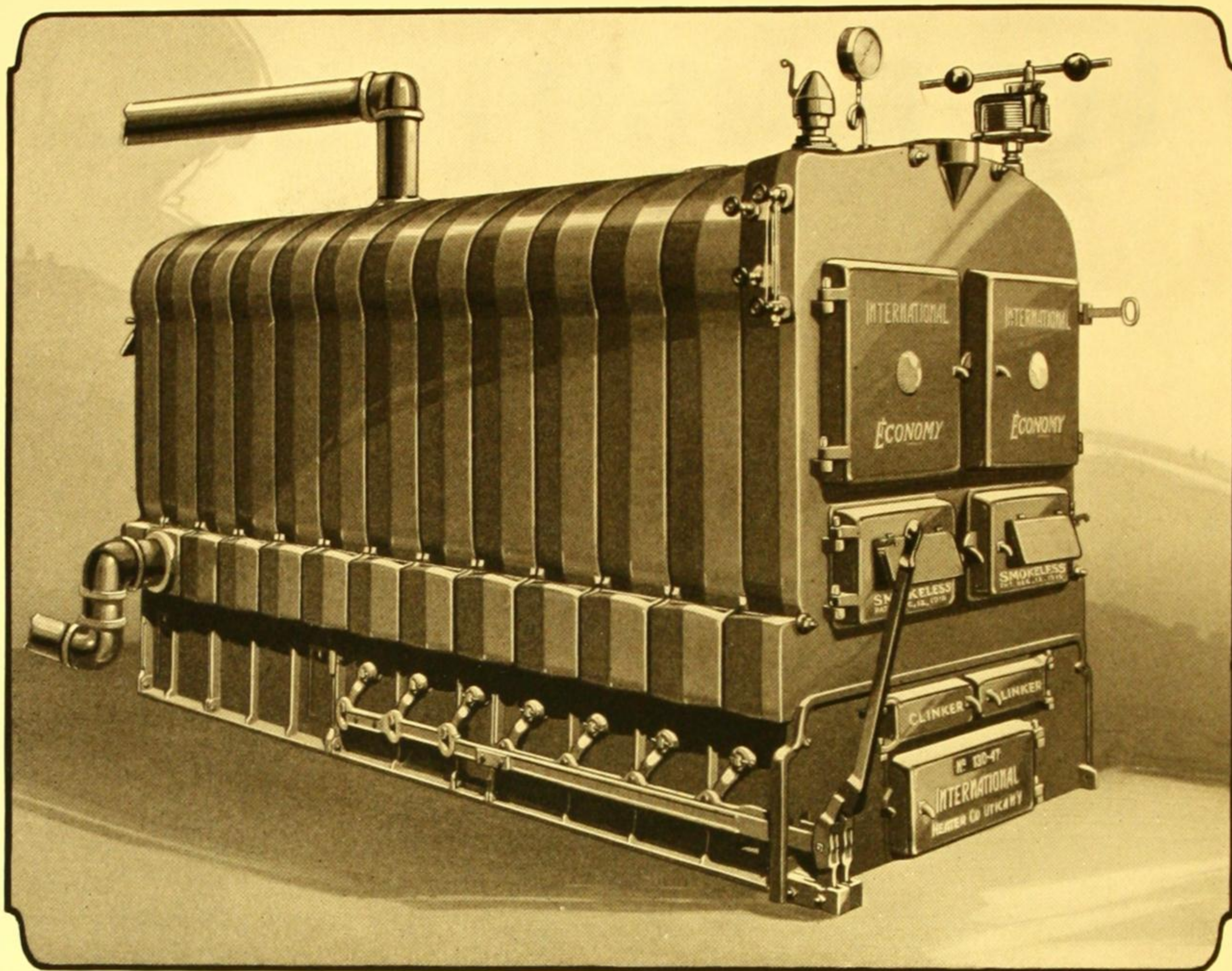
CHICAGO
1933-35 Wentworth Avenue

DETROIT
3961 Cass Avenue

CLEVELAND
1441 Davenport Avenue, N. E.

NASHUA, N. H.
110 Chestnut Street

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Left front view showing Grate Connections. No. 130-47 **INTERNATIONAL** Economy Smokeless Boiler

Standards

Economy Boilers are built by expert workmen in a modern shop equipped particularly for the production of high class boilers.

They are tested and rated according to the code adopted by the American Society of Heating and Ventilating Engineers and their safety standards conform to those recommended by the American Society of Mechanical Engineers.

This means that Economy Boilers comply with the best standards as regards safety, ratings, economy and durability.



Economy Smokeless Boilers

Introductory

While anthracite coal where obtainable is recognized as a clean and desirable fuel, especially for the smaller residential installations, the lower cost of bituminous or soft coal makes it advantageous to select apparatus designed to burn the latter fuel for all the larger operations.

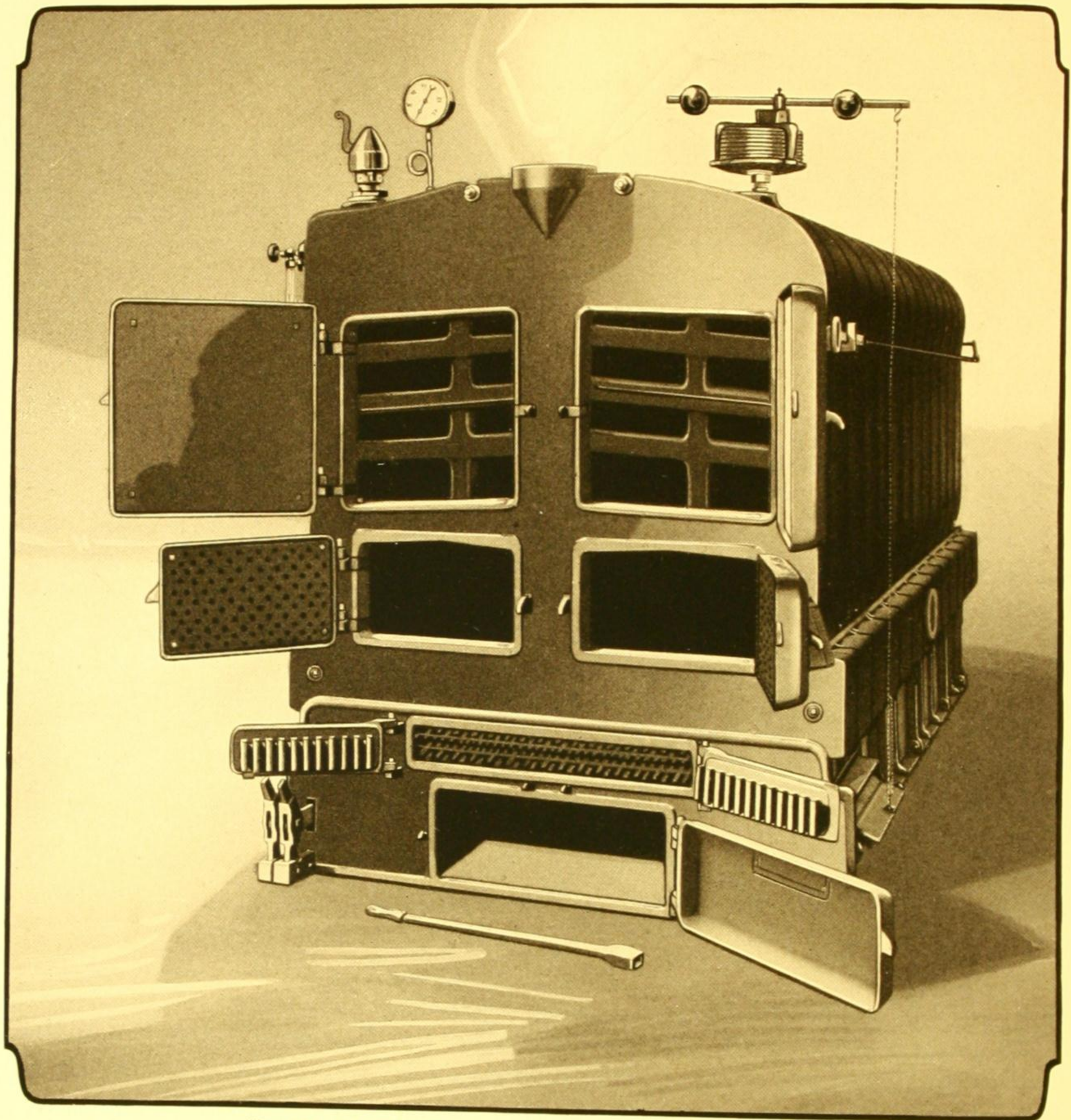
The growing sentiment for the elimination of smoke,—in the interests of better health, better sanitation and appearance,—is causing more and more cities every year to pass stringent smoke ordinances which make it necessary to provide apparatus which will burn bituminous coal without smoke. It is not practical to do this in a boiler designed for other fuels and many types of smokeless boilers leave much to be desired.

In modern heating practice there is a decided trend toward the use of cast iron heating boilers in larger units where formerly steel boilers were used, so that there is an insistent demand for apparatus which will not only burn soft coal smokelessly and with economy, but which also will provide the advantages of longer life, minimum of repairs and efficient design and construction. The **INTERNATIONAL Economy Smokeless** fills this demand.

General Features of Design

In general exterior appearance and design the Economy Smokeless follows closely along the lines of the regular Economy Sectional Boiler retaining all the desirable features of the latter, which are described in detail further on.

It is recognized that a boiler of this type to be of greatest practical value should be one in which firing conditions are kept as simple as possible and at the same time the result of smokeless combustion is accomplished; therefore the Economy has only a single grate and the smokeless feature of the design is similar to that known to some engineers as the Kent Wing Wall type.

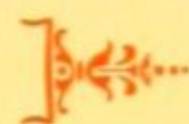


No. 130-47 **INTERNATIONAL** Economy Smokeless Boiler

Showing cleanout, feed, clinker, and ashpit doors open. Note baffles inside cleanout doors, also finger bar extensions inside clinker doors

Requirements of Smokeless Combustion

As every engineer knows, there are three factors necessary to properly burn the volatile smoky gases of soft coal: *Temperature, Mixture, and Time*. Each of these factors has been given proper consideration in the design of the Economy Smokeless as the following description will show.



Wing Wall and Combustion Chambers

The furnace, or heat generating portion, consists of two principal parts: the fire box and the combustion chamber. The fire box contains the fuel, and gradually distills the volatile gases from the fuel in a manner similar to a gas retort.

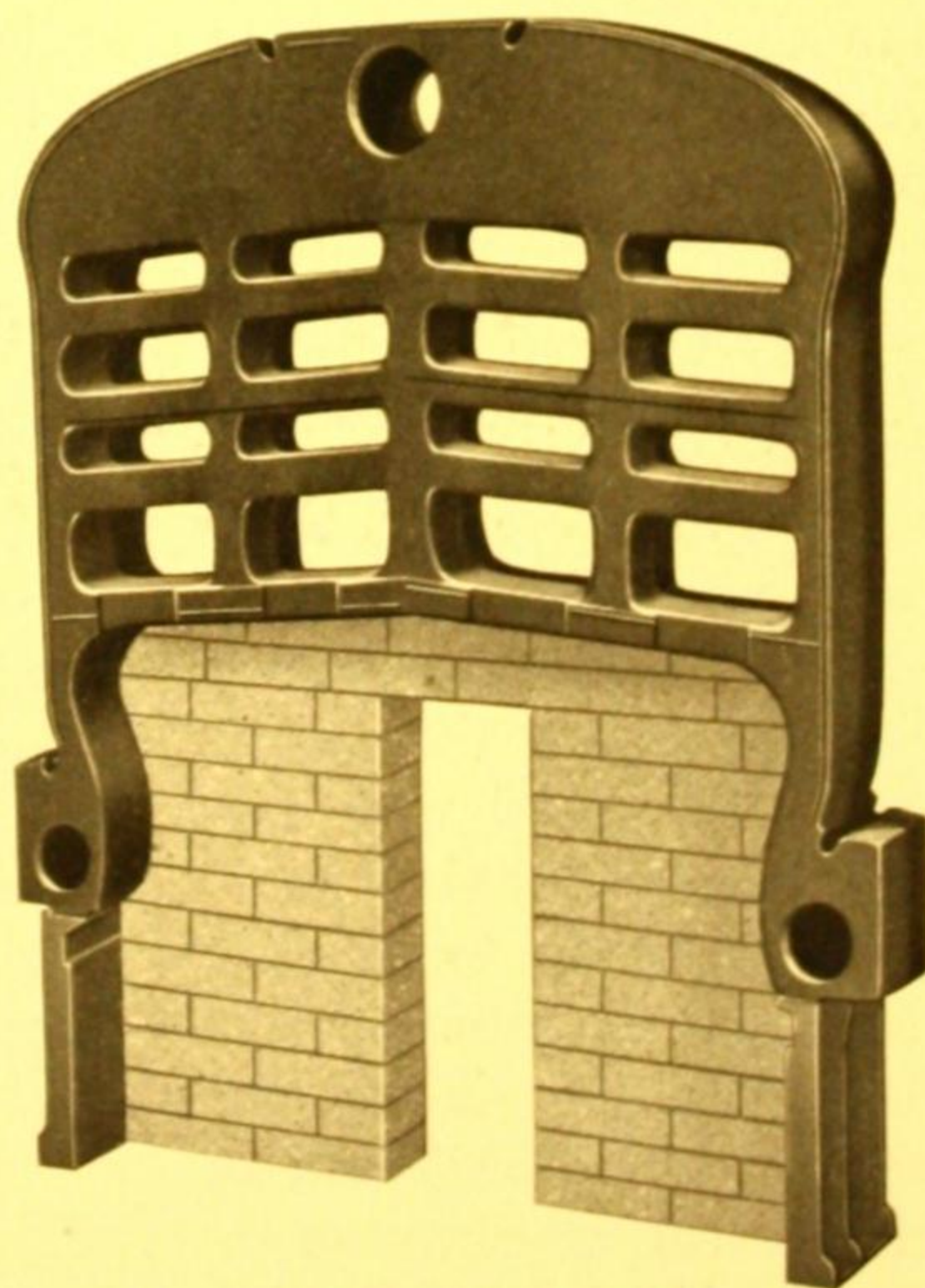
The space back of the fire box is divided by a fire brick wing wall into primary and secondary combustion chambers.

The fire travel in Economy Smokeless Boilers is to the rear of the boiler from the fire box, then to the front through the lower flues and back to the smoke outlet through the upper flues. At the end of the fire box there is a bridgewall section having horizontal openings near the crown sheet. The smoke and gases pass through these openings into the primary combustion chamber. As the opening in the center of the fire brick wing wall at the back of the primary combustion chamber is in a vertical position the gases are compelled to pass in a vertical plane to the secondary combustion chamber where they again must change to a horizontal plane to reach the flue passages. The brick wing wall becomes heated to incandescence. Its function is to maintain a high temperature of the gases and this, coupled with the swirling motion of the gases given by the reversal of the planes, causes a thorough mixing of the flames with the combustible gases and the air admitted over the fire, resulting in an intense combustion and thorough ignition and burning of gases and soot particles that would otherwise escape up the chimney unburned.

The primary combustion chamber—that between the bridge wall and the wing wall—gives the necessary Temperature and Mixture of air and gases for



Bridge Wall Section



Brick Wing Wall



complete combustion. The secondary combustion chamber, back of the wing wall, furnishes the Time element by continuing the combustion process of the primary chamber.

Air Control

A matter of prime importance, which has a direct bearing on the proper working of the primary and secondary combustion chambers, is Air Control.

It is a fact well known to engineers that excess air passing through a boiler is the most frequent cause of large fuel bills. Government bulletins even go so far as to attribute 40 per cent of all fuel waste to this cause. A boiler may be smokeless and still exceedingly wasteful of fuel if the air supply is not properly regulated.

In the Economy Smokeless the air needed for proper combustion is admitted over the fire through the fire door, a method recommended by the U. S. Bureau of Mines as the most effective for three reasons:

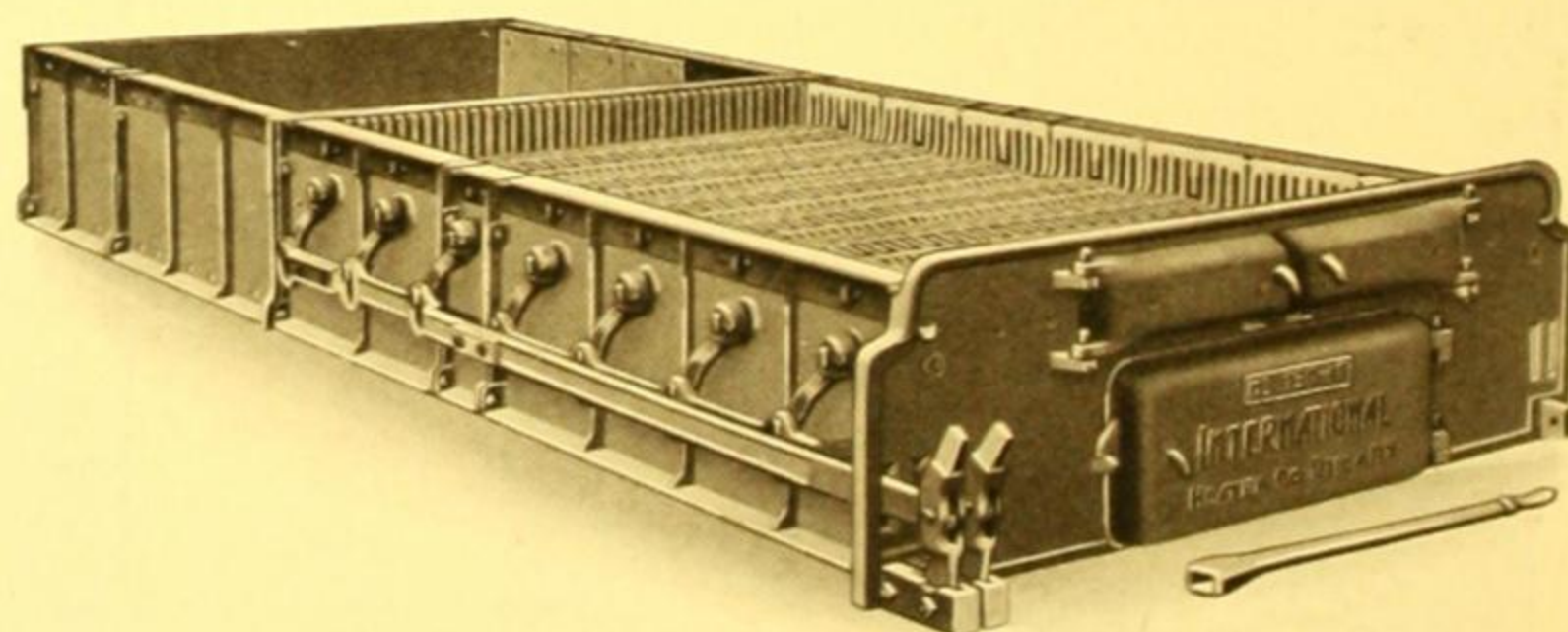
1. The perforations in the fire door throw the air over the hot fuel bed in fine streams, thereby raising the air to a high temperature.

2. The long travel of this heated air over the entire length of the fire gives the air and the combustible gases the needed Time to form a mixture, even before reaching the primary combustion chamber, which functions to complete this mixture of air and gas.

3. The most practical reason, however, for admitting air over the fuel bed through the fire door is to enable the fireman to conveniently control the air supply so as to suit the demands, which vary greatly. Air admitted over the fire through other places, because of the lack of control, causes a waste greater than the saving of fuel. Immediately after firing the demand for excess air over the fire is so great that in high volatile coals it is often necessary to partially open the fire door, while a few minutes later this demand is very slight.

The Ashpit

The ashpit is high with a large roomy door and there are no connecting bars inside to interfere with the proper removal of ashes. In the primary and secondary combustion chambers—back of the ashpit proper—the bases on the larger sizes are lined with fire brick, the smaller sizes have cast iron lining to protect them from the intense heat. The draft door is on the side near the middle of the fire. This promotes a more uniform combustion



Ashpit and Grates, **INTERNATIONAL Economy Smokeless Boiler.** In this picture the connections are shown at the left side, but the same connections can just as easily be placed at the right.



and also removes the draft chain from the front where it would interfere with the operation of the fire and flue doors.

It is recommended that a pit be provided under all boilers as per sketch and dimensions given on page 12.

Grate and Fire Box Construction

The grate bars have their connections entirely outside the ashpit and may be placed so as to operate either from the left or the right hand side, whichever may prove more convenient in any particular installation. The shaker arms are attached to the end of the bars by cotter pins. This makes it an easy matter to drop them in place when mounting the boiler or in case replacement of a bar should be necessary. By the simple removal of a cotter pin outside the ashpit any grate bar may be disconnected without interfering with the shaking of the other bars. There are no bolts or cotter pins inside the ashpit.

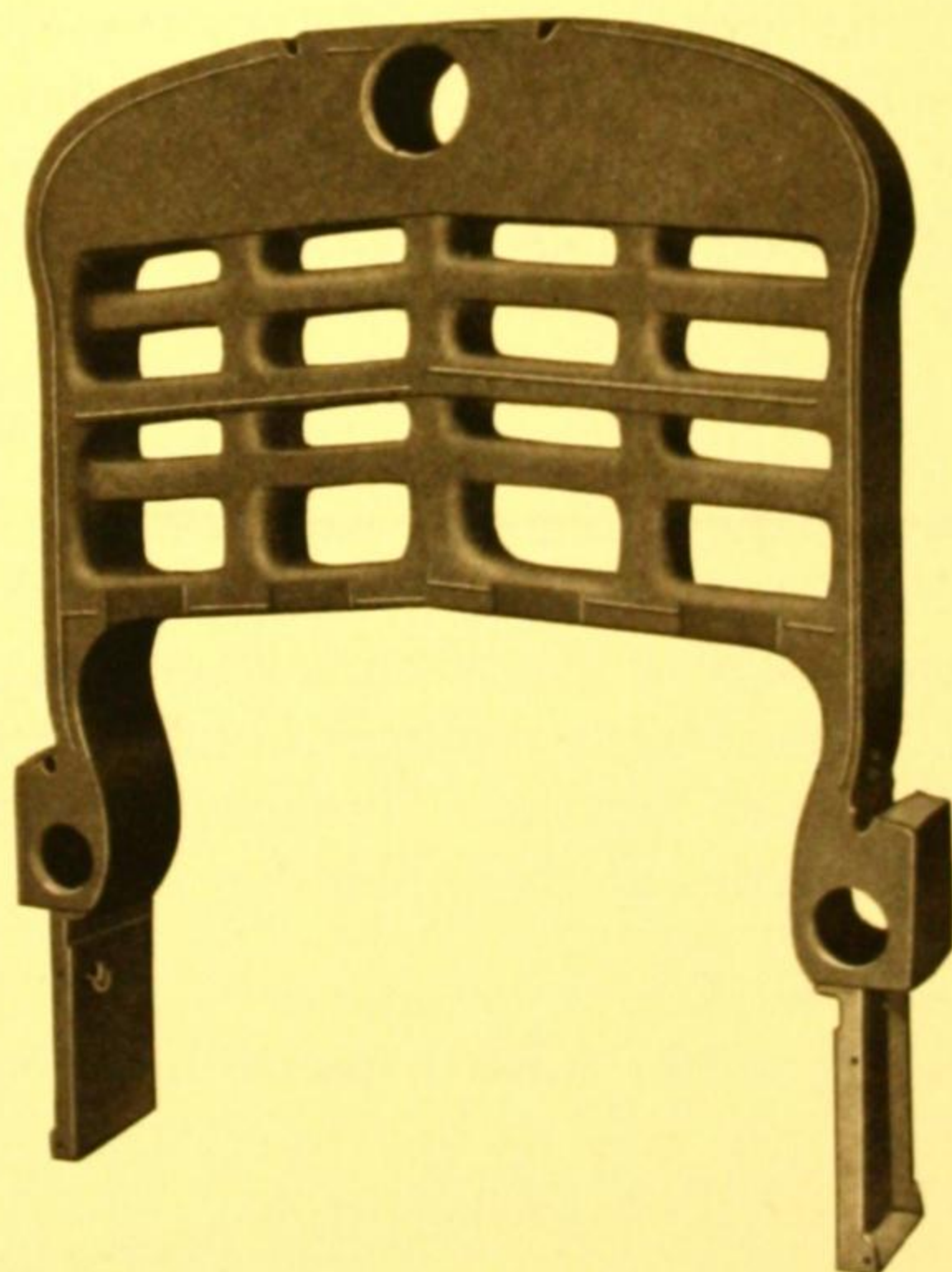
The faces of the bars have grooves cast along the fingers in which the fine ash collects preventing clinkers from burning on the bars and making it easier to clean the fire.

Side Grate Fingers

The main function of a grate is to allow air to pass through the fuel bed. In various types of boilers this is done in one of three ways: the air is passed through the grates either upward, downward, or crosswise.

Reference to the illustration will show how the fire box just above the grate level is provided at the front, back and sides with vertical bars, or Side Grate Fingers, which are actually extensions of the grate. This construction gives the Economy Boiler the combined advantages of the upward and crosswise methods of admitting air.

Numerous tests with and without these side grate fingers prove that they serve to reduce the resistance through the grates, and so help to overcome the possible handicap of a poor draft. They also materially increase both the capacity and efficiency of the boiler. This is because the cross draft around the fire edges keeps the fire alive near the cored castings, where it is most needed, and where with the ordinary type of grate it usually dies down before coal is consumed.



Typical Intermediate Section of
47" Boiler



Dry Steam Without a Header

This is an important feature of Economy Boilers which should not be overlooked. It means a direct saving both for the owner and for the steamfitter.

The design of the Steam Dome is such that the distance between the water line and the connecting nipples is greater than in most boilers. This extra space and the internal construction of the sections assure dry steam and a steady water line without building a header when the boiler is being erected, as is necessary with many push nipple types of boilers. This conserves head room and reduces materially the cost of installation. At the same time, the water line is above the upper flue surfaces (see illustration pages 20 and 21), protecting the boiler from risk of damage and conserving the heat, since hot gases impart but little heat to any surface which has only steam back of it.

The opening for the upper try cock is enlarged and has a bushing which may be removed when blowing off the boiler to remove all grease, oil, etc.

Another exclusive feature of the Economy line which is very important is that the return inlets and flow outlets in the steam boilers are never in the same section, further insuring dry steam and a steady water line.

Easy to Clean

Engineers know that $\frac{1}{8}$ " of soot on the flue surfaces of a boiler reduces the efficiency of the radiating surface so covered 28 per cent, and they therefore recognize that ease of cleaning is a feature very much to be desired.

Reference to the illustrations on pages 20 and 21 will show you that the sections are so shaped that all flue surfaces are easily cleaned from the front of the boiler through the large doors provided for that purpose. There are no deep corrugations or pockets in which soot can collect where it cannot be reached with a brush.

Additional cleanouts are provided at the sides and back for the primary and secondary combustion chambers. The large manhole door located at the back of this boiler not only provides easy access for cleaning but makes it possible for the fitter to change or reconstruct the brick wing wall through this opening, without removing the back section.

There are two plugged outlets each in the front and back section in line with the return nipples. These are for connecting a hose for washing out the sediment that settles at these points.

Ratings on Economy Smokeless Boilers

Because of the nature of the fuel, soft coal boilers are rated on an hourly basis. The Economy Smokeless, however, holds several hours' supply of coal and requires less firing attention than any soft coal boiler of which we have knowledge.



Most soft coal boilers are given a higher rating than the corresponding sizes on a hard coal basis, and we have found after a long series of tests, that we would be justified in giving the Economy Smokeless Boilers from 10 per cent to 25 per cent higher rating than the corresponding hard coal boiler. On account of the variation in the quality and nature of soft coal, however, we have taken the conservative course of rating the Economy Smokeless Boilers the same as corresponding sizes of hard coal boilers.

Methods of Firing Soft Coal

There are three different methods of firing soft coal in general use. These are known as the Center, the Coking and the Alternate methods, according to the nature of the coal and the type of the boiler. Any of these methods may be used in firing the Economy Smokeless Boilers.

The choice of method to be used will depend somewhat on the conditions surrounding the installation as well as on the volatile content and structure of the coal. If in doubt as to which is best suited to your conditions request the advice of our engineers.

Center Method

This method is the most simple and often considered the best suited to most boilers and to the different grades of coal. It also requires the least attention, and is the most popular method with experienced janitors.

The lumps of hot fuel are broken up and pushed part to the rear and part to the front, leaving a thin layer of hot coal over the center portion of the grates. The fresh fuel is then piled in the center of the fire box leaving across the front and back a margin of hot fuel to burn the combustible gases.

Years of practice have demonstrated that this Center Method of firing soft coal is the best all-around method.

Coking Method

Here, the red hot lumps of coked fuel are broken up and pushed back over the rear part of the grates. The fresh coal is then fired on the front portion of the grate. This method is not suitable for coals which clinker readily, but has been found to give good results where free burning soft coal of a high volatile content is used.

Alternate Method

In this method the coked lumps of hot fuel are broken up and pushed to either the right or the left side of the fire box. The fresh coal is then fired on the opposite side. On the next firing this operation is reversed, the fresh coal being fired on the side opposite to the previous firing. This method is not suitable for most types of boilers. Janitors, as a rule, object to it on account of the difficulty of pushing coal sidewise with a slice bar.



Important—Extensive tests made by the U. S. Bureau of Mines demonstrate the great advantage of thoroughly moistening run-of-mine soft coal by sprinkling it with a hose at least 24 hours before firing. It must not be too wet when fired, and no lumps larger than a man's fist should be fired except when checking or banking the fire. To prevent smoke coming out of the fire door when firing or when fixing the fire, close the draft door, the ashpit door and the check draft, and open the damper in the smoke pipe. Do the same when cleaning the boiler, and open only one flue door at a time.

Facts in Condensed Form

1. Steady water line.
2. Large steam dome.
3. Large nipples to promote free circulation.
4. Dry steam without a header.
5. Only one main outlet from boiler need be used.
6. Heating surfaces below water line.
7. Constructed so as to be free from strains from unequal expansion.
8. Gas passages arranged to give high rate of heat transmission with least draft loss.
9. Ample size combustion chamber to complete burning of gases before they escape up the chimney.
10. Wing wall design used has proved best in power practice.
11. Sufficient coal capacity to develop full capacity for long periods and allow for rekindling.
12. Auxiliary air admitted over fire at front, under convenient control.
13. Up draft boiler simple to handle; does not require expert fireman.
14. Grates are so arranged that half of fire box may be used when only half capacity is needed.
15. All grate attachments are outside of ashpit and may be placed on either side of boiler. Grate bars are easily removed.
16. Flues easily cleaned from front; no pockets to collect soot.
17. The man-hole in Back Section makes it possible to make any necessary changes in brick wall without disturbing the boiler sections.
18. The draft door is on side of ashpit, where it does not interfere with chains when firing or cleaning boiler.
19. Ratings on conservative basis fully substantiated by tests and in practice.
20. Will burn any fuel ordinarily used for heating purposes.
21. Because of modern scientific design will burn even the lower grades of fuel with minimum of smoke.
22. Backed by a company having 84 years experience in the manufacture of heating apparatus.



SMOKELESS BOILERS



Guarantee

INTERNATIONAL Economy Boilers are guaranteed only to the extent of furnishing new castings for any found defective in manufacture, and we cannot entertain claims for expenses.

The ratings are based on cast iron radiation condensing $\frac{1}{4}$ lb. of steam per square foot of radiation per hour. The heating contractor must figure the necessary condensing surfaces to cover all piping (mains and risers, flows and returns) together with allowances for the greater evaporative power of pipe coils, indirect and direct-indirect radiation, etc.

And such an additional factor of safety should be added as will cover extreme low temperatures, defective chimney drafts, dirty flue surfaces, poor coal and poor care.

An over-load of from 50 per cent to 100 per cent is frequently put on a boiler when forced to get up heat suddenly, when the building and radiators are cold, as is sometimes the case in the early morning when fires have been banked over night. This extra demand should not be overlooked in figuring the capacity of the boiler required.

These are factors that vary with each individual job and should be carefully considered by the heating contractor in estimating the capacity and the type of boiler best suited for each particular job.

*Asbestos Covering Required

NUMBER	LBS.	NUMBER	LBS.
80-22 and 22-80	550	90-47 and 47-90	1050
90-22 and 22-90	600	100-47 and 47-100	1150
100-22 and 22-100	650	110-47 and 47-110	1250
80-28 and 28-80	600	120-47 and 47-120	1350
90-28 and 28-90	650	130-47 and 47-130	1450
100-28 and 28-100	700	140-47 and 47-140	1550
90-34 and 34-90	750	150-47 and 47-150	1650
100-34 and 34-100	825	160-47 and 47-160	1750
110-34 and 34-110	900	170-47 and 47-170	1850
120-34 and 34-120	975	180-47 and 47-180	1950
130-34 and 34-130	1050	190-47 and 47-190	2050
140-34 and 34-140	1125	200-47 and 47-200	2150
150-34 and 34-150	1200	210-47 and 47-210	2250

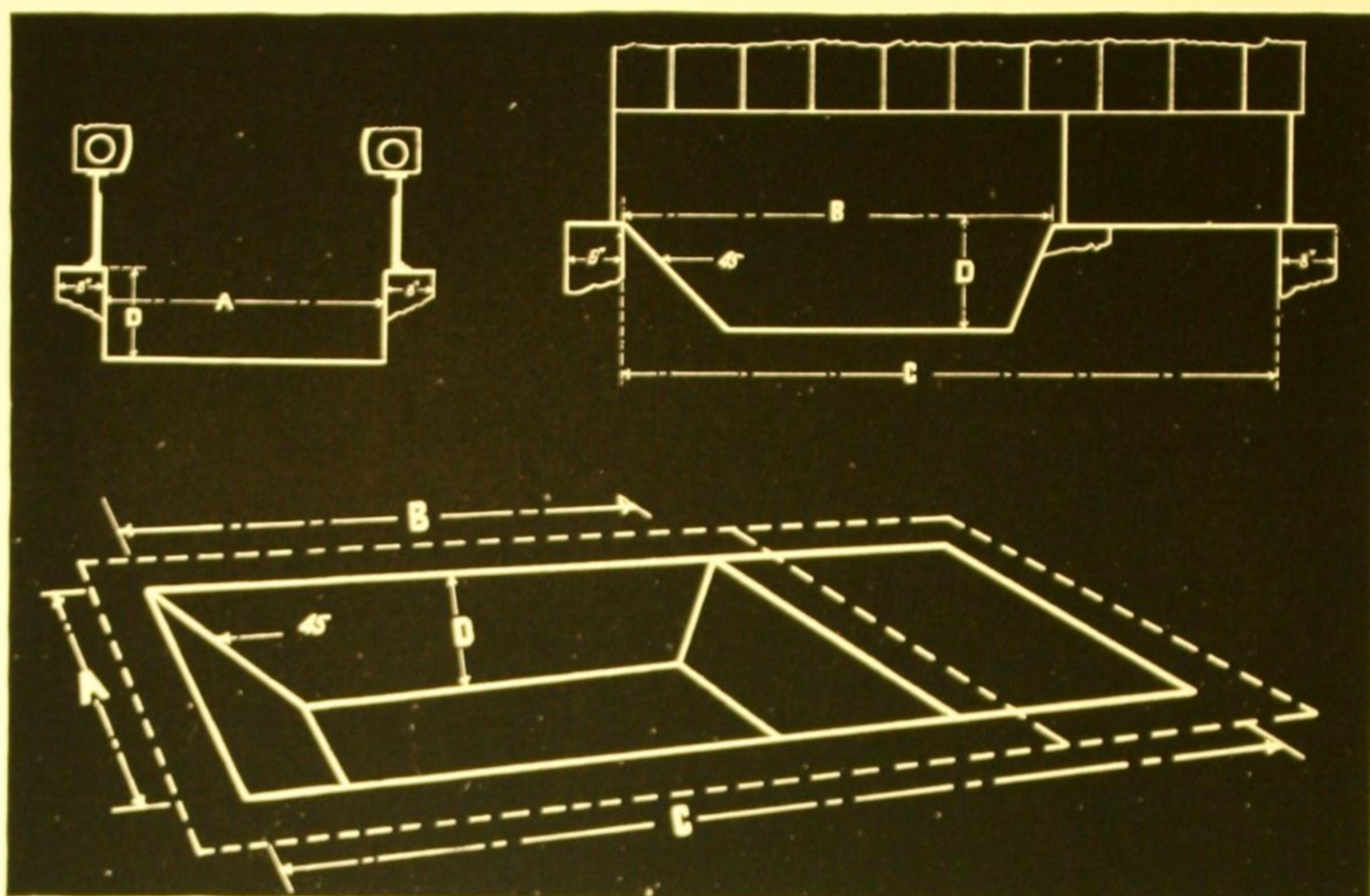
*Asbestos covering should be at least $1\frac{1}{2}$ " thick on all Smokeless Boilers.

Telegraph Code

STEAM BOILERS	STEAM BOILERS	STEAM BOILERS
80-22.....Esaau	110-34.....Esbgi	130-47.....Esojp
90-22.....Esacp	120-34.....Esbka	140-47.....Esoof
100-22.....Esadn	130-34.....Esdhi	150-47.....Estuz
80-28.....Esacl	140-34.....Eseay	160-47.....Estyr
90-28.....Esagh	150-34.....Eseov	170-47.....Estzo
100-28.....Esaid	90-47.....Esigp	180-47.....Esugb
90-34.....Esbav	100-47.....Esnyl	190-47.....Esukt
100-34.....Esbdo	110-47.....Esobg	200-47.....Esupi
	120-47.....Esoca	210-47.....Esute
WATER BOILERS	WATER BOILERS	WATER BOILERS
22-80.....Etaco	34-110.....Etbau	47-130.....Esrak
22-90.....Etaek	34-120.....Etbid	47-140.....Esrac
22-100.....Etaic	34-130.....Etbpr	47-150.....Etbpo
28-80.....Etans	34-140.....Etbve	47-160.....Etbug
28-90.....Etaop	34-150.....Etdro	47-170.....Etdco
28-100.....Etapn	47-90.....Etaxx	47-180.....Etcka
34-90.....Etavd	47-100.....Espko	47-190.....Etcas
34-100.....Etaxz	47-110.....Espog	47-200.....Etdif
	47-120.....Etbcl	47-210.....Etdot



Measurements for Ashpit and Foundation under Boiler

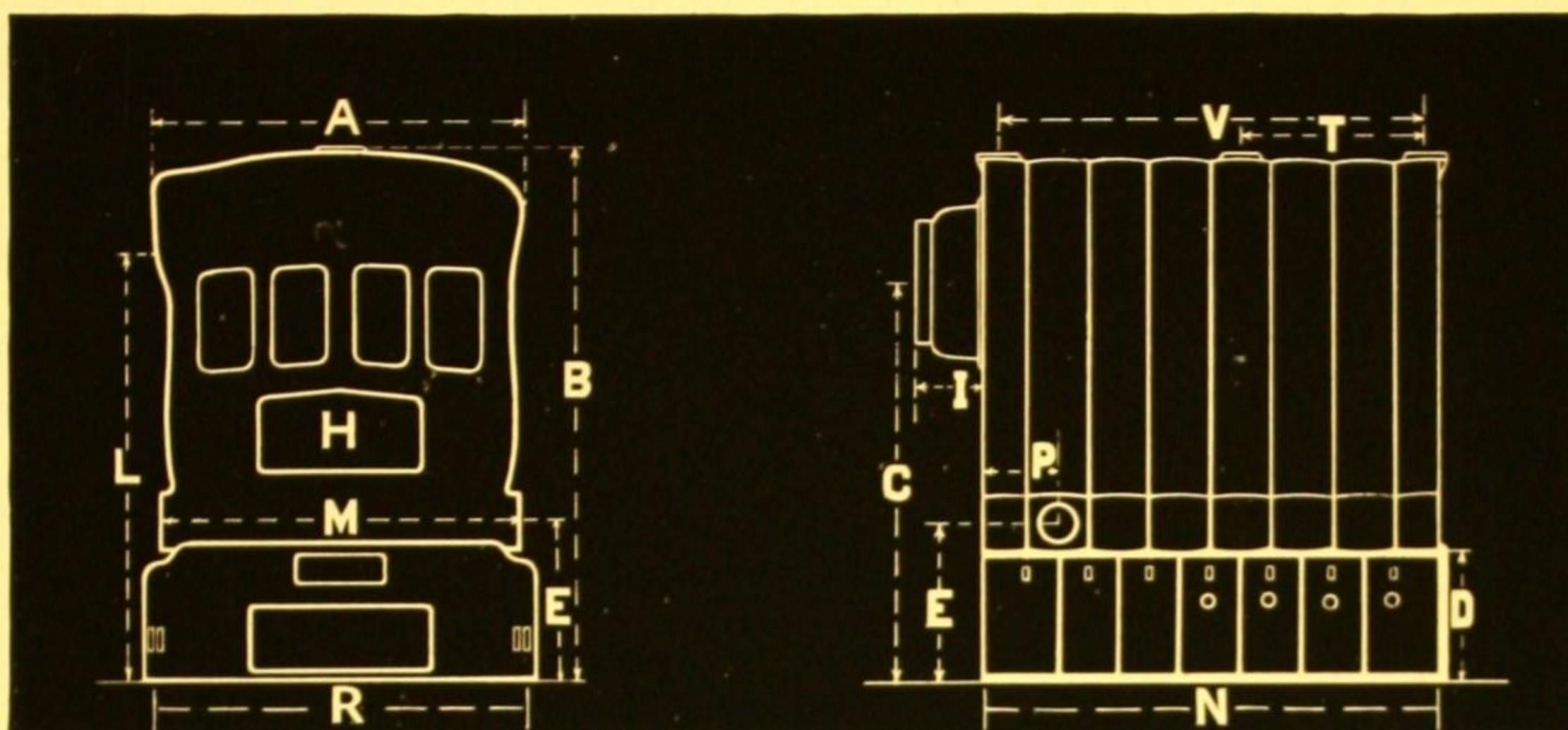


A—Width of Pit Inside Measurement. B—Length of Pit Inside Measurement.
C—Length of Foundation. D—Depth of Ashpit

NUMBER	A	B	C	D	NUMBER	A	B	C	D
80-22 and 22-80	23	33	59	12	90-47 and 47-90	46	52	82	15
90-22 and 22-90	23	41	67	12	100-47 and 47-100	46	62	92	15
100-22 and 22-100	23	49	75	12	110-47 and 47-110	46	62	102	15
					120-47 and 47-120	46	62	112	15
80-28 and 28-80	29	33	59	12	130-47 and 47-130	46	72	122	15
90-28 and 28-90	29	41	67	12	140-47 and 47-140	46	72	132	15
100-28 and 28-100	29	49	75	12	150-47 and 47-150	46	72	142	15
					160-47 and 47-160	46	72	152	15
90-34 and 34-90	34	41	67	15	170-47 and 47-170	46	72	162	15
100-34 and 34-100	34	49	75	15	180-47 and 47-180	46	82	172	15
110-34 and 34-110	34	57	83	15	190-47 and 47-190	46	82	182	15
120-34 and 34-120	34	65	91	15	200-47 and 47-200	46	82	192	15
130-34 and 34-130	34	65	99	15	210-47 and 47-210	46	82	202	15
140-34 and 34-140	34	65	107	15					
150-34 and 34-150	34	74	115	15					



Economy Smokeless Boiler Measurements



Front View Fig. 1

Side View Fig. 2

THESE MEASUREMENTS IN INCHES APPLY TO OUTLINE DRAWINGS FIG. 1 AND FIG. 2

SERIES	A	B	L	M	R	E	D	C	I	H
22	34	57	47	31	30	19	15 $\frac{1}{4}$	44	11	9 x 17
28	40 $\frac{1}{2}$	62 $\frac{1}{2}$	50	38	35	19 $\frac{1}{2}$	15 $\frac{1}{4}$	47 $\frac{1}{2}$	11	9 x 17
34	49	68	54	47 $\frac{1}{2}$	41	20	15 $\frac{1}{4}$	50 $\frac{1}{2}$	11	11 x 21
47	55	73	59	60	53	21 $\frac{1}{2}$	16 $\frac{1}{4}$	54	11	(2) 10 x 17

THESE MEASUREMENTS IN INCHES APPLY TO OUTLINE DRAWINGS FIG. 2

NUMBER	N	V	T	P	NUMBER	N	V	T	P
80-22 and 22-80	61	56	24	10	90-47 and 47-90	85	77	30	12
90-22 and 22-90	69	64	24	10	100-47 and 47-100	95	87	30	12
100-22 and 22-100	77	72	24	10	110-47 and 47-110	105	97	30	12
					120-47 and 47-120	115	107	30	12
80-28 and 28-80	61	56	24	10	130-47 and 47-130	125	117	30	12
90-28 and 28-90	69	64	24	10	140-47 and 47-140	135	127	30	12
100-28 and 28-100	77	72	24	10	150-47 and 47-150	145	137	30	12
					160-47 and 47-160	155	147	30	12
90-34 and 34-90	69	64	24	10	170-47 and 47-170	165	157	30	12
100-34 and 34-100	77	72	24	10	180-47 and 47-180	175	167	30	12
110-34 and 34-110	85	80	24	10	190-47 and 47-190	185	177	30	12
120-34 and 34-120	93	88	24	10	200-47 and 47-200	195	187	30	12
130-34 and 34-130	101	96	24	10	210-47 and 47-210	205	197	30	12
140-34 and 34-140	109	104	24	10					
150-34 and 34-150	117	112	24	10					



Ratings and Dimensions—Steam Sizes

Number	*Rating Square Feet	†TAPPINGS		MINIMUM CHIMNEY DIMENSIONS		Size of Grate Inches	Additional Area of Side Grate Fingers Sq. In.
		Supply	Return	Size Flue Inches	Height Feet		
80-22	1700	3-3½"	2-3½"	12 x 12	40	22 x 32	380
90-22	2000	3-3½"	2-3½"	12 x 12	45	22 x 40	432
100-22	2300	3-3½"	2-3½"	12 x 16	50	22 x 48	484
80-28	2450	3-4"	2-4"	16 x 16	40	28 x 32	432
90-28	2800	3-4"	2-4"	16 x 16	45	28 x 40	484
100-28	3150	3-4"	2-4"	16 x 16	50	28 x 48	536
90-34	4000	3-5"	2-5"	16 x 16	50	34 x 40	528
100-34	4500	3-5"	2-5"	16 x 20	50	34 x 48	580
110-34	5000	3-5"	2-5"	20 x 20	55	34 x 56	632
120-34	5500	3-5"	2-5"	20 x 20	55	34 x 64	684
130-34	6000	3-5"	2-5"	20 x 20	60	34 x 64	684
140-34	6500	3-5"	2-5"	20 x 24	60	34 x 64	684
150-34	7000	3-5"	2-5"	20 x 24	60	34 x 72	736
90-47	8300	3-6"	2-6"	24 x 24	60	47 x 50	677
100-47	9300	3-6"	2-6"	24 x 24	65	47 x 60	742
110-47	10300	3-6"	2-6"	24 x 24	70	47 x 60	742
120-47	11300	4-6"	2-6"	24 x 28	70	47 x 60	742
130-47	12300	4-6"	2-6"	24 x 28	75	47 x 70	807
140-47	13300	4-6"	2-6"	24 x 28	75	47 x 70	807
150-47	14300	4-6"	2-6"	28 x 28	80	47 x 70	807
160-47	15300	4-6"	2-6"	28 x 28	85	47 x 70	807
170-47	16300	4-6"	2-6"	28 x 32	90	47 x 70	807
180-47	17300	4-6"	2-6"	28 x 32	95	47 x 80	872
190-47	18300	4-6"	2-6"	28 x 32	100	47 x 80	872
200-47	19300	4-6"	2-6"	32 x 32	105	47 x 80	872
210-47	20300	4-6"	2-6"	32 x 32	110	47 x 80	872

SERIES	22	28	34	47
Height of Water Line	47"	50"	54"	59"
Diameter of Smoke Outlet, Inches	12	14	16	24
Height to Supply Outlets	57"	62½"	68"	73"
Add to height for Trimmings	11"	11"	11"	12"
Width of Boiler, including Trimmings	40"	45"	52"	61"
Height from floor to Center of Return Tappings	19"	19½"	20"	21½"
Height of Fire Box to Crown	22"	24"	26"	26"
Height, Grate to Middle of Feed Door	16"	18"	18"	18"
Size of Feed Door	9" x 17"	9" x 17"	11" x 21"	(2) 10" x 17"

Trimmings as listed below are sent with each Steam Boiler without extra charge.

One Sylphon Regulator with lever, weight, chains and pulleys.

One Water Gauge complete with glass and brass rods.

Two Brass Compression Cocks.

One Steam Gauge with Pigtail Syphon.

One Safety Valve. Outlets for Safety Valves are tapped in accordance with the A. S. M. E. Code.

*Judgment should be used in fitting the Boiler to a job. As an example: do not attach a short Boiler to a relatively high stack or a long Boiler to a relatively low stack. Suit the Boiler to the job.

†The Economy line of Boilers does not require a header. Plug and bush tappings to size of mains.



SMOKELESS BOILERS



Ratings and Dimensions—Water Sizes

Number	*Rating Square Feet	†TAPPINGS		MINIMUM CHIMNEY DIMENSIONS		Size of Grate Inches	Additional Area of Side Grate Fingers Sq. In.
		Supply	Return	Size Flue Inches	Height Feet		

SPECIAL NOTICE

Sizes of smoke collars as noted on pages 14 and 15 refer to those used on new style smokehood recently adopted.

On boilers now being shipped the sizes of smoke collars are as follows:

SERIES	22	28	34	47
Area of Smoke Outlet, Square Inches	126	203	201	578
*Area equivalent to a round pipe having diameter of	12"	16"	†16"	27"

*Oval smoke outlets with 22", 28" and 47" series.

While size of smoke collar given is equal to the area of a circular pipe having that diameter, the circumference of the oval collars is equal to that of a circle having the following diameters: 22" Boilers - 14" circle; 28" Boilers - 18" circle; and 47" Boilers - 30" circle.

†A 16" round outlet supplied with 34" Boilers.



12	40	22 x 32	380
12	45	22 x 40	432
12	50	22 x 48	484
16	40	28 x 32	432
16	45	28 x 40	484
16	50	28 x 48	536
16	50	34 x 40	528
20	50	34 x 48	580
20	55	34 x 56	632
20	55	34 x 64	684
20	60	34 x 64	684
24	60	34 x 64	684
24	60	34 x 72	736
24	60	47 x 50	677
24	65	47 x 60	742
24	70	47 x 60	742
28	70	47 x 60	742
28	75	47 x 70	807
28	75	47 x 70	807
28	80	47 x 70	807
28	85	47 x 70	807
32	90	47 x 70	807
32	95	47 x 80	872
32	100	47 x 80	872
32	105	47 x 80	872
32	110	47 x 80	872

	28	34	47
	62½"	68"	73"
	14	16	24
	42"	48"	59"
	19½"	20"	21½"
	24"	26"	26"
	18"	18"	18"
"	9" x 17"	11" x 21"	(2) 10" x 17"

No Trimmings are sent with Water Boilers.

Fire Tools. With every Steam and Water Boiler there is sent free a Brush, Poker, and Scraper.

*Judgment should be used in fitting the Boiler to a job. As an example: do not attach a short Boiler to a relatively high stack or a long Boiler to a relatively low stack. Suit the Boiler to the job.

†The Economy line of Boilers does not require a header. Plug and bush tappings to size of mains.



Chimney Sizes for INTERNATIONAL Economy Smokeless Boilers

SINGLY AND IN BATTERIES

22" Smokeless Boiler

ONE BOILER					TWO BOILERS		
Steam Boiler Number	Water Boiler Number	Steam Rating Sq. Ft.	Minimum Chimney Size Inches	Minimum Height Feet	Steam Rating Sq. Ft.	Minimum Chimney Size Inches	Minimum Height Feet
80-22	22-80	1700	12 x 12	40	3400	12 x 16	45
90-22	22-90	2000	12 x 12	45	4000	16 x 16	50
100-22	22-100	2300	12 x 16	50	4600	16 x 20	50

28" Smokeless Boiler

ONE BOILER					TWO BOILERS			THREE BOILERS		
Steam Boiler Number	Water Boiler Number	Steam Rating Sq. Ft.	Minimum Chimney Size Inches	Minimum Height Feet	Steam Rating Sq. Ft.	Minimum Chimney Size Inches	Minimum Height Feet	Steam Rating Sq. Ft.	Minimum Chimney Size Inches	Minimum Height Feet
80-28	28-80	2450	16 x 16	40	4900	16 x 20	45	7350	20 x 20	50
90-28	28-90	2800	16 x 16	45	5600	16 x 20	50	8400	20 x 20	55
100-28	28-100	3150	16 x 16	50	6300	20 x 20	55	9450	20 x 24	60

34" Smokeless Boiler

90-34	34-90	4000	16 x 16	50	8000	20 x 20	55	12000	20 x 24	60
100-34	34-100	4500	16 x 20	50	9000	20 x 24	55	13500	24 x 24	60
110-34	34-110	5000	20 x 20	55	10000	20 x 24	60	15000	24 x 24	65
120-34	34-120	5500	20 x 20	55	11000	24 x 24	60	16500	24 x 28	65
130-34	34-130	6000	20 x 20	60	12000	24 x 24	65	18000	24 x 28	70
140-34	34-140	6500	20 x 24	60	13000	24 x 24	70	19500	28 x 28	70
150-34	34-150	7000	20 x 24	60	14000	24 x 28	70	21000	28 x 28	75

47" Smokeless Boiler

90-47	47-90	8300	24 x 24	60	16600	28 x 32	65	24900	30 x 36	75
100-47	47-100	9300	24 x 24	65	18600	28 x 32	70	27900	30 x 36	80
110-47	47-110	10300	24 x 24	70	20600	28 x 32	75	30900	30 x 36	85
120-47	47-120	11300	24 x 28	70	22600	30 x 36	75	33900	36 x 36	85
130-47	47-130	12300	24 x 28	75	24600	30 x 36	80	36900	36 x 36	90
140-47	47-140	13300	24 x 28	75	26600	30 x 36	85	39900	36 x 36	95
150-47	47-150	14300	28 x 28	80	28600	36 x 36	90	42900	36 x 42	95
160-47	47-160	15300	28 x 28	85	30600	36 x 36	95	45900	36 x 42	100
170-47	47-170	16300	28 x 32	90	32600	36 x 36	100	48900	42 x 42	100
180-47	47-180	17300	28 x 32	95	34600	36 x 36	105	51900	42 x 42	105
190-47	47-190	18300	28 x 32	100	36600	36 x 36	110	54900	42 x 42	110
200-47	47-200	19300	32 x 32	105	38600	42 x 42	110	57900	42 x 48	110
210-47	47-210	20300	32 x 32	110	40600	42 x 42	115	60900	42 x 48	115



SMOKELESS BOILERS



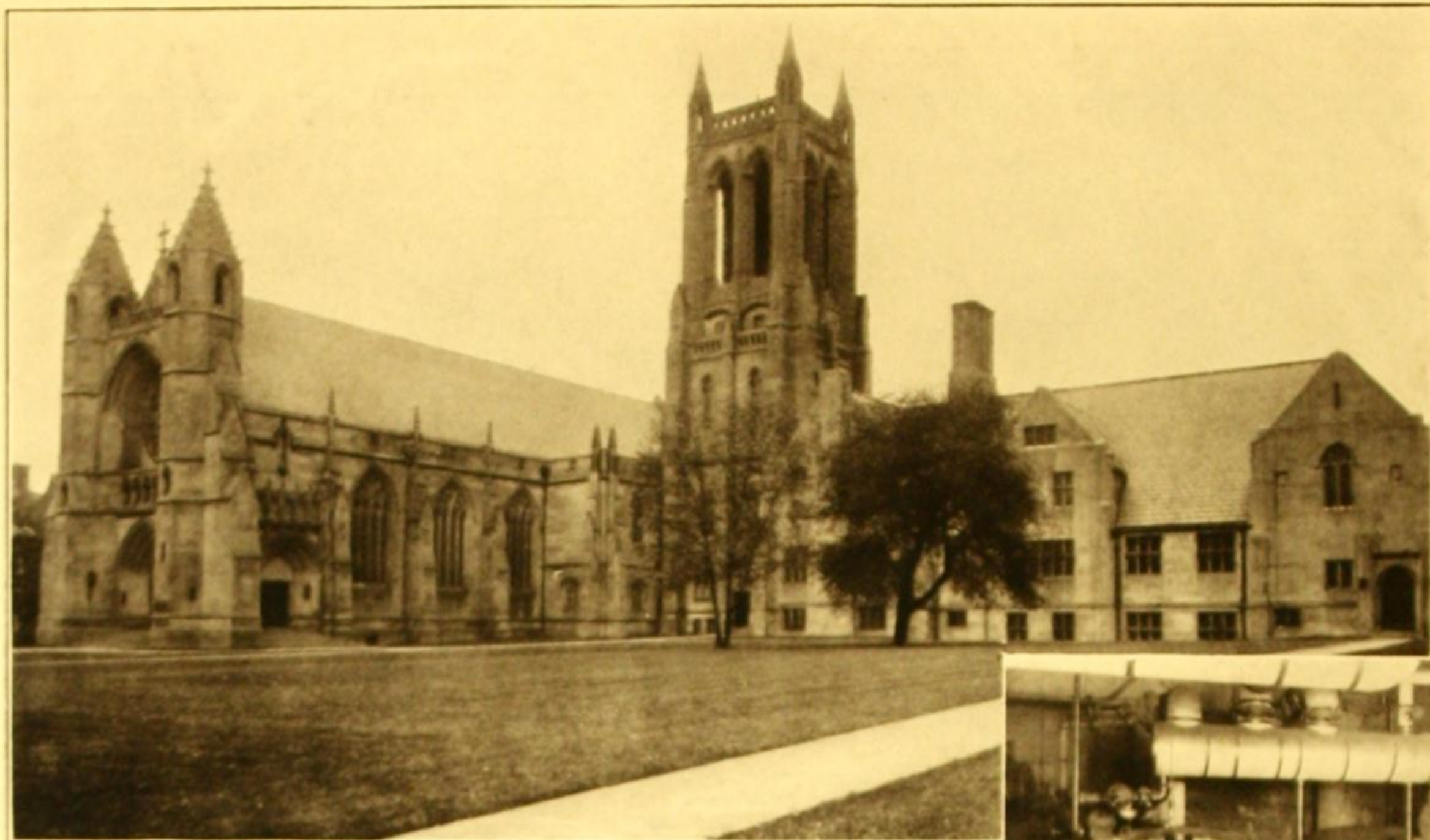
FAIR STREET SCHOOL, New Haven, Conn.

Heated by Two No. 110-34 Economy Smokeless Boilers, Installed by Wm. J. Sullivan, New Haven, Conn.



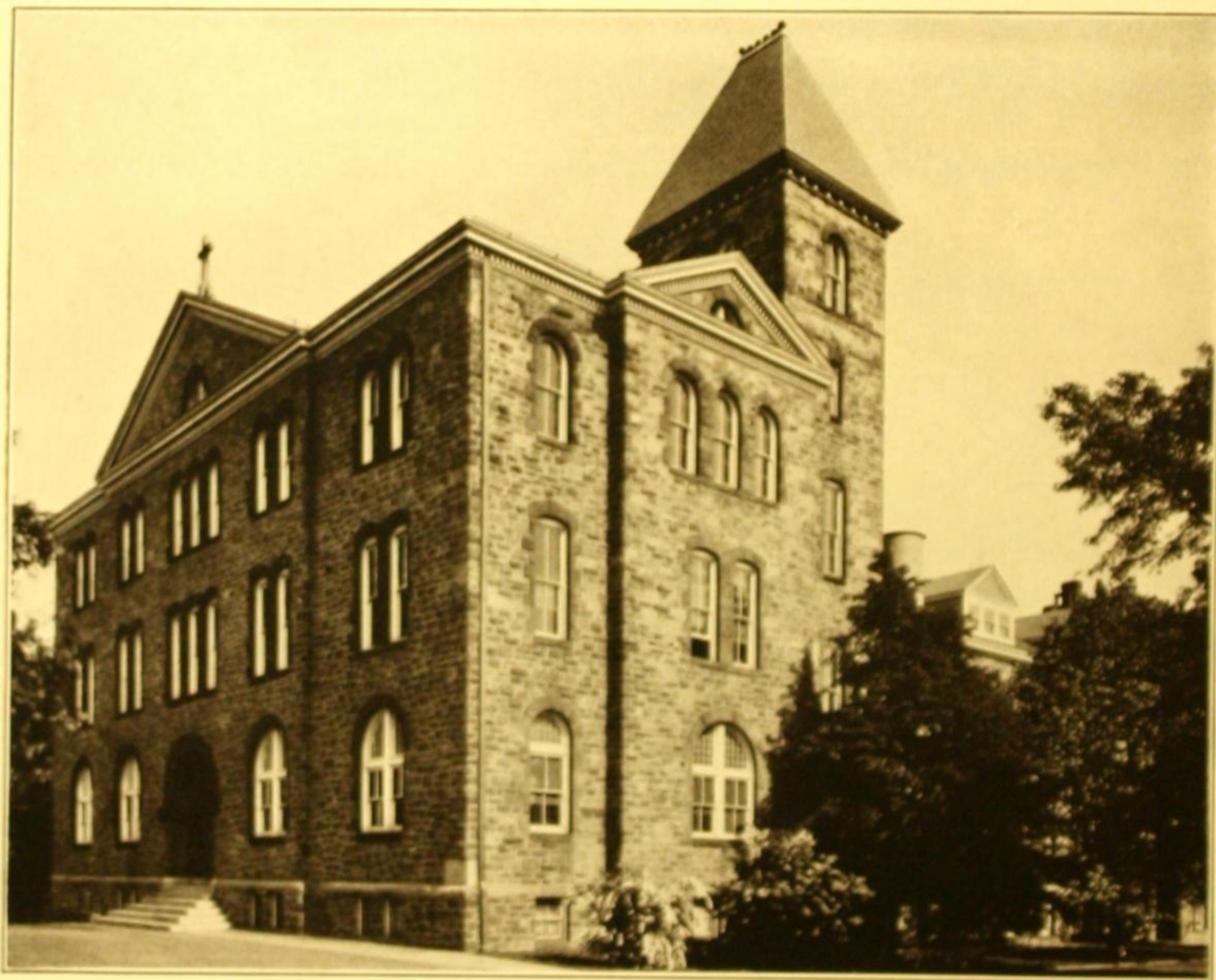
THE GILBERT SPRUANCE COMPANY BUILDING
Richmond and Tioga Sts., Philadelphia, Pa.

Heated by One 47-Inch Economy Smokeless Boiler, Harry F. Murphy & Co., Inc., Heating Contractors and Engineers; Harry Gill, Jr., General Contractor; Ralph E. White, Architect.



CHURCH OF THE COVENANT, Cleveland, Ohio

Heated by Two No. 120-47 Economy Smokeless Boilers, Roemer Heating Company, Heating Contractors; R. H. P. Hamilton, Architect; Ernest Szceley, Consulting Engineer.

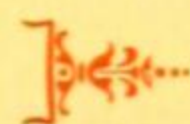


ST. MARY'S FEMALE ORPHANAGE, Baltimore, Md.

Heated by One No. 100-34 and One No. 150-34 Economy Smokeless Boiler, Francis C. Dorsey, Heating Contractor.

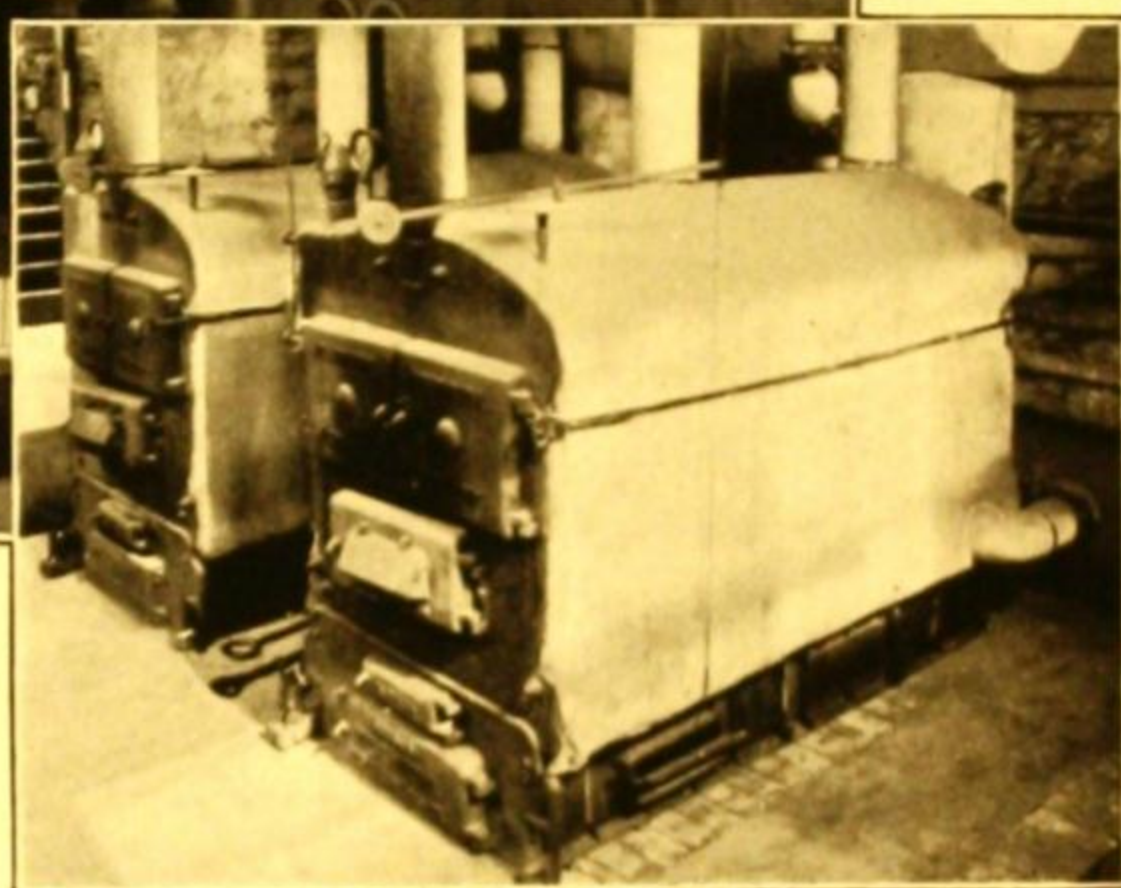


SMOKELESS BOILERS



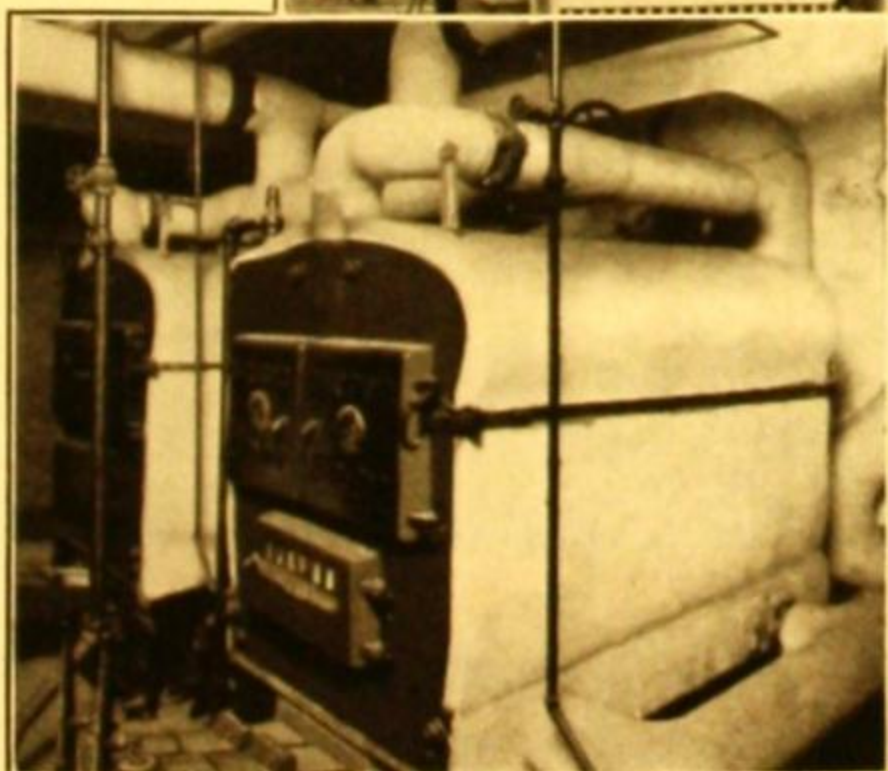
EAST PARK SCHOOL, Pittsburgh, Pa.

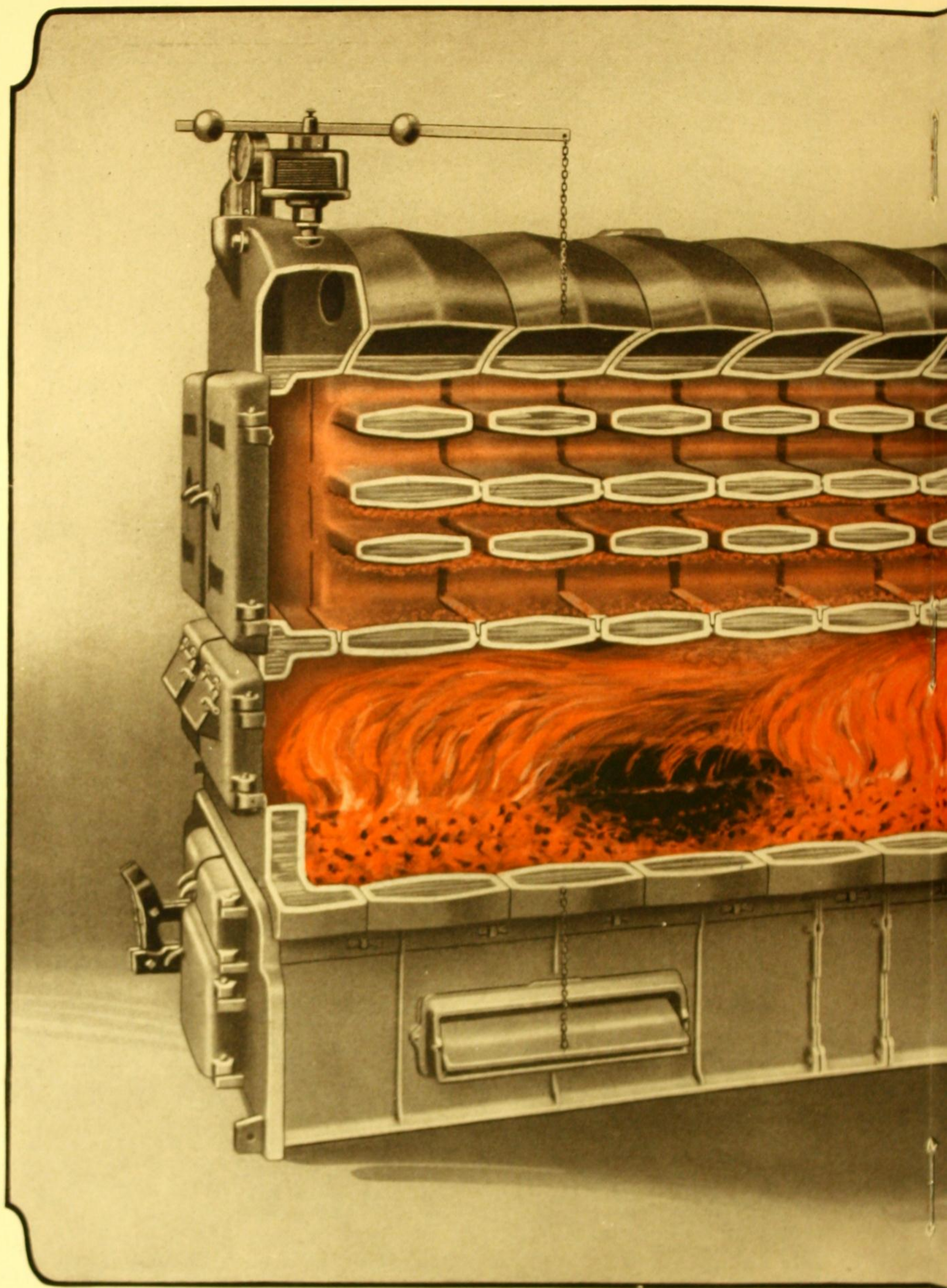
Heated by Two No. 120-34 Economy Smokeless Boilers (an additional boiler was later installed), McGinness-Smith Company, plumbing and heating contractors, Board of Education, Pittsburgh architects and engineers.



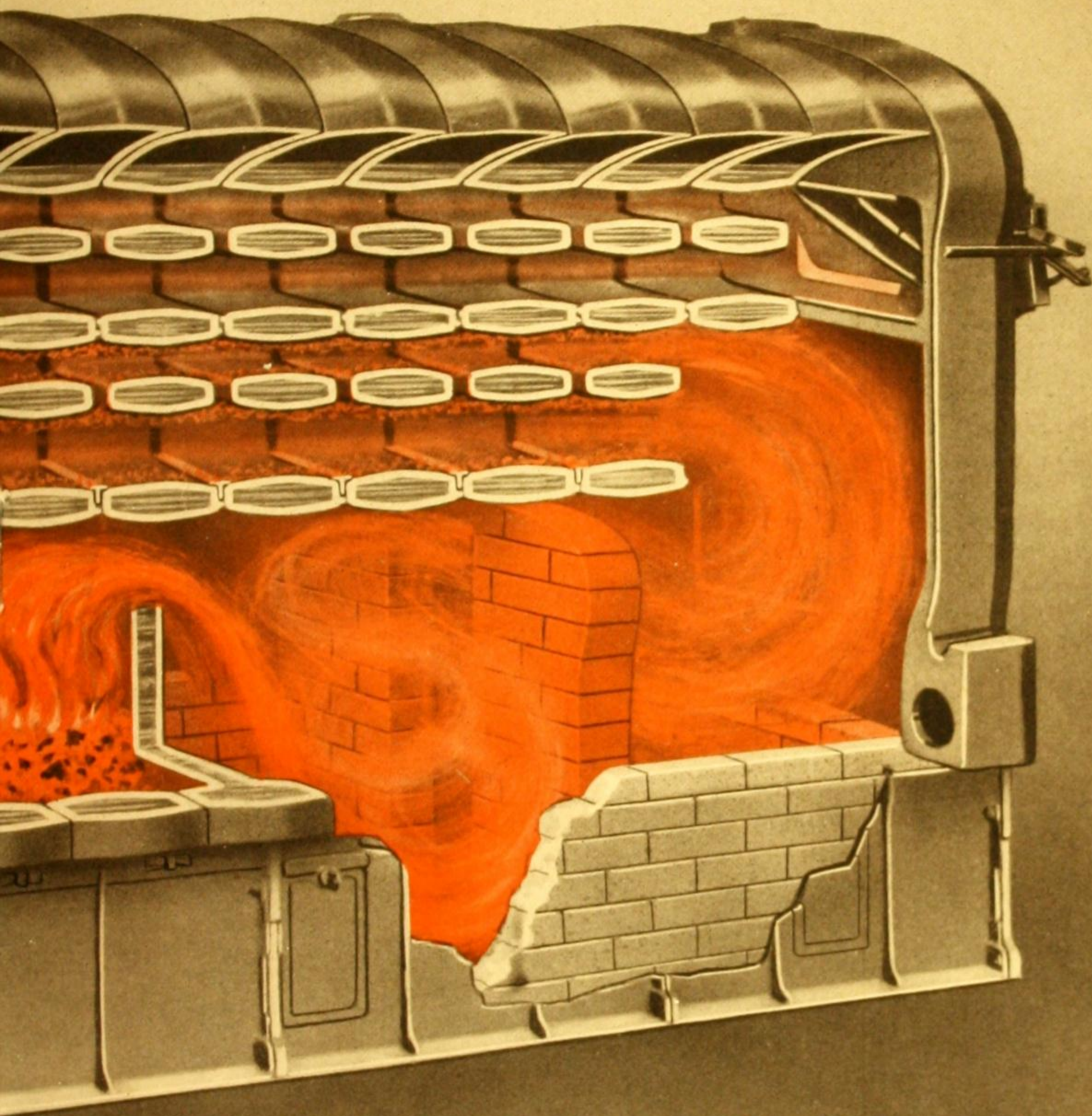
EDGEWORTH CLUB
(Edgeworth), Pittsburgh, Pa.

Heated by Two No. 34-100 Gas-Fired Economy Smokeless Boilers, Huffman-Wolfe Company, heating contractors; Eric Fisher Wood & Company, plumbing architects; Thomas F. Payne, plumbing engineer.





CUTAWAY VIEW OF NO. 140-47 INTERNATIONAL
Showing Circulation of Gases, Bridge Wall, Brick Wing Wall



ATIONAL ECONOMY SMOKELESS BOILER
Wall, Primary and Secondary Combustion Chambers



HASS-KRUSE BUILDING, Davenport, Ia.

Clausen & Kruse, architects. J. J. Ryan, Plumbing & Heating Co., heating contractors. Heated by One 47-Inch Economy Smokeless Boiler.

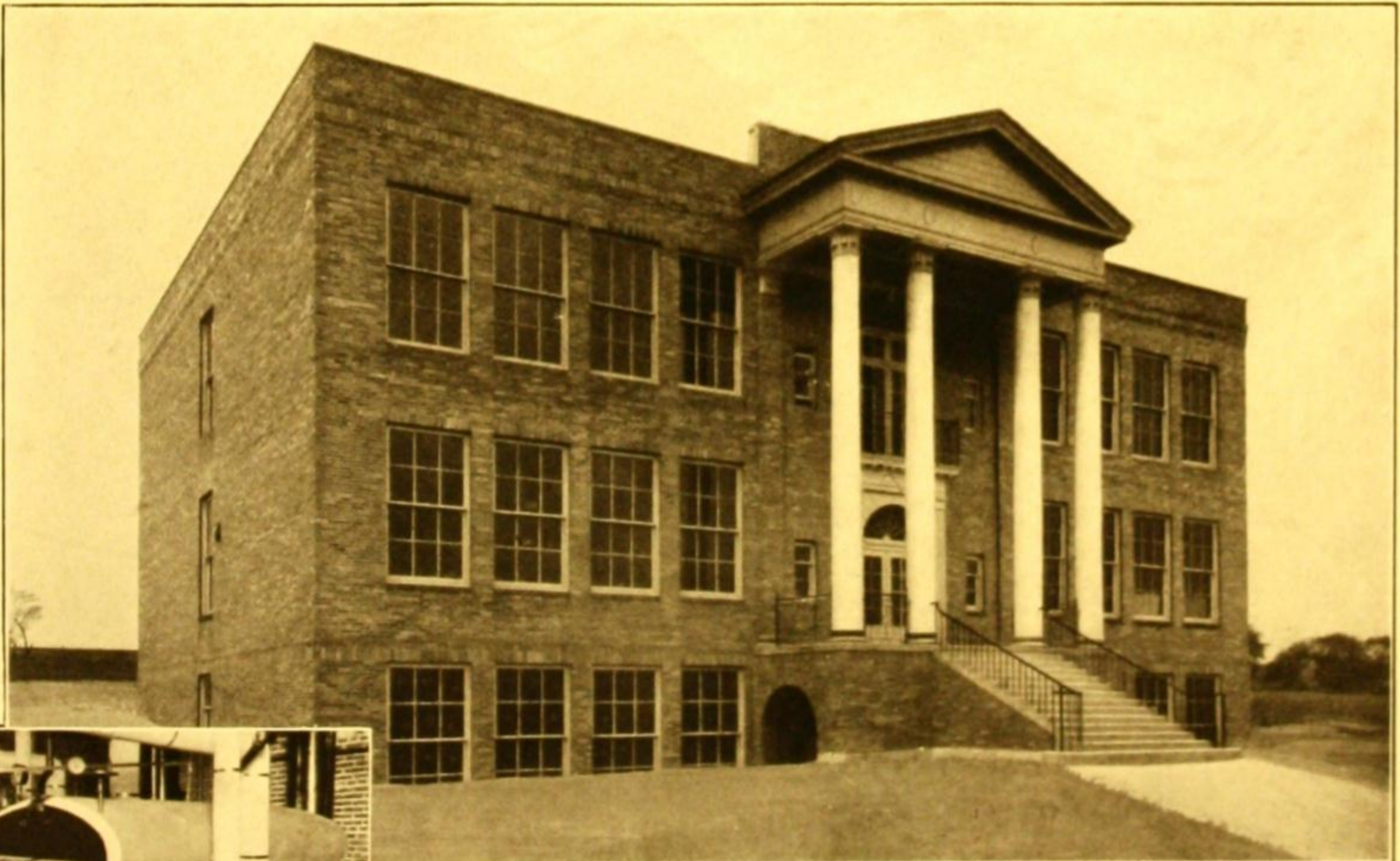
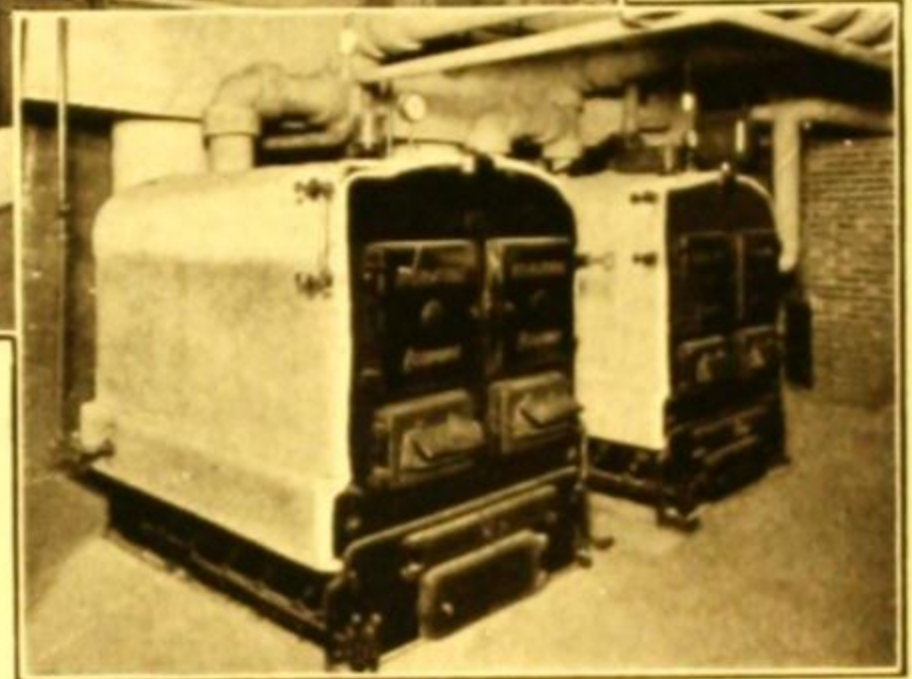


SMOKELESS BOILERS



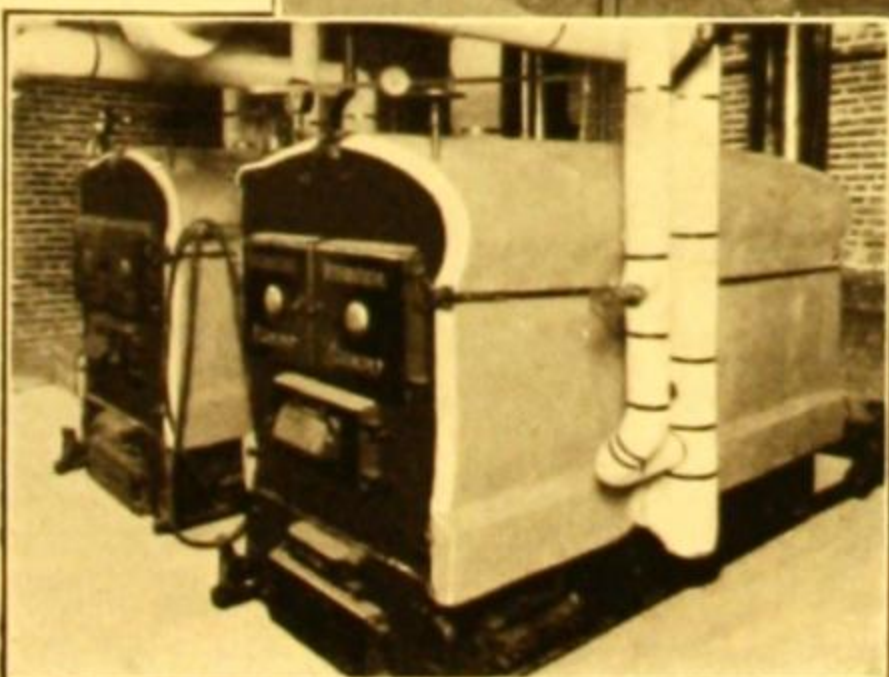
HALLS-GROVE SCHOOL, Pittsburgh, Pa.

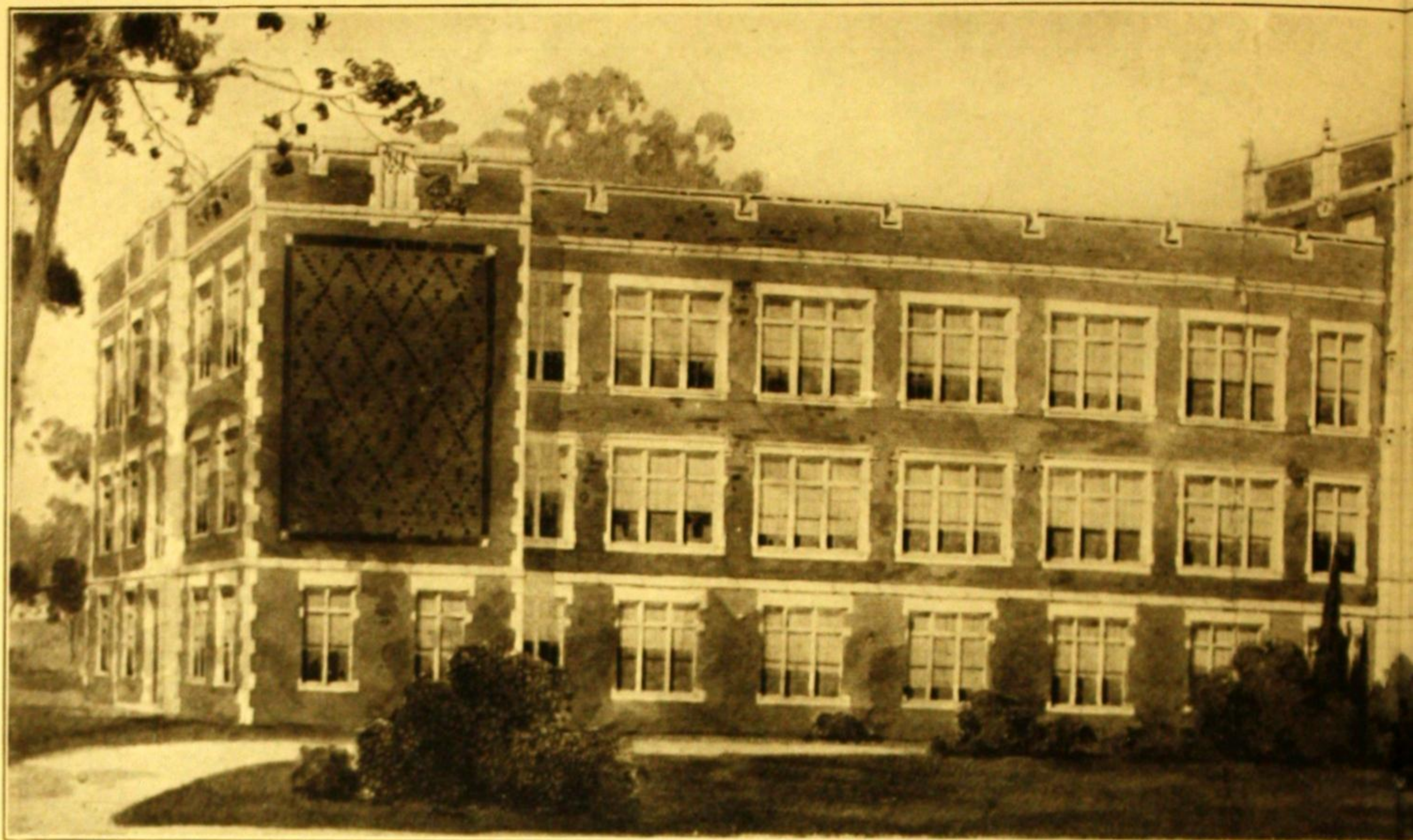
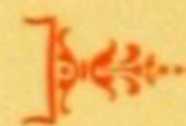
Heated by Two 47-Inch Economy Smokeless Boilers, Joseph A. Landon & Sons Company, plumbing and heating contractors; Board of Education, Pittsburgh, architects and engineers.



PUBLIC SCHOOL, Blawnox, Pa.

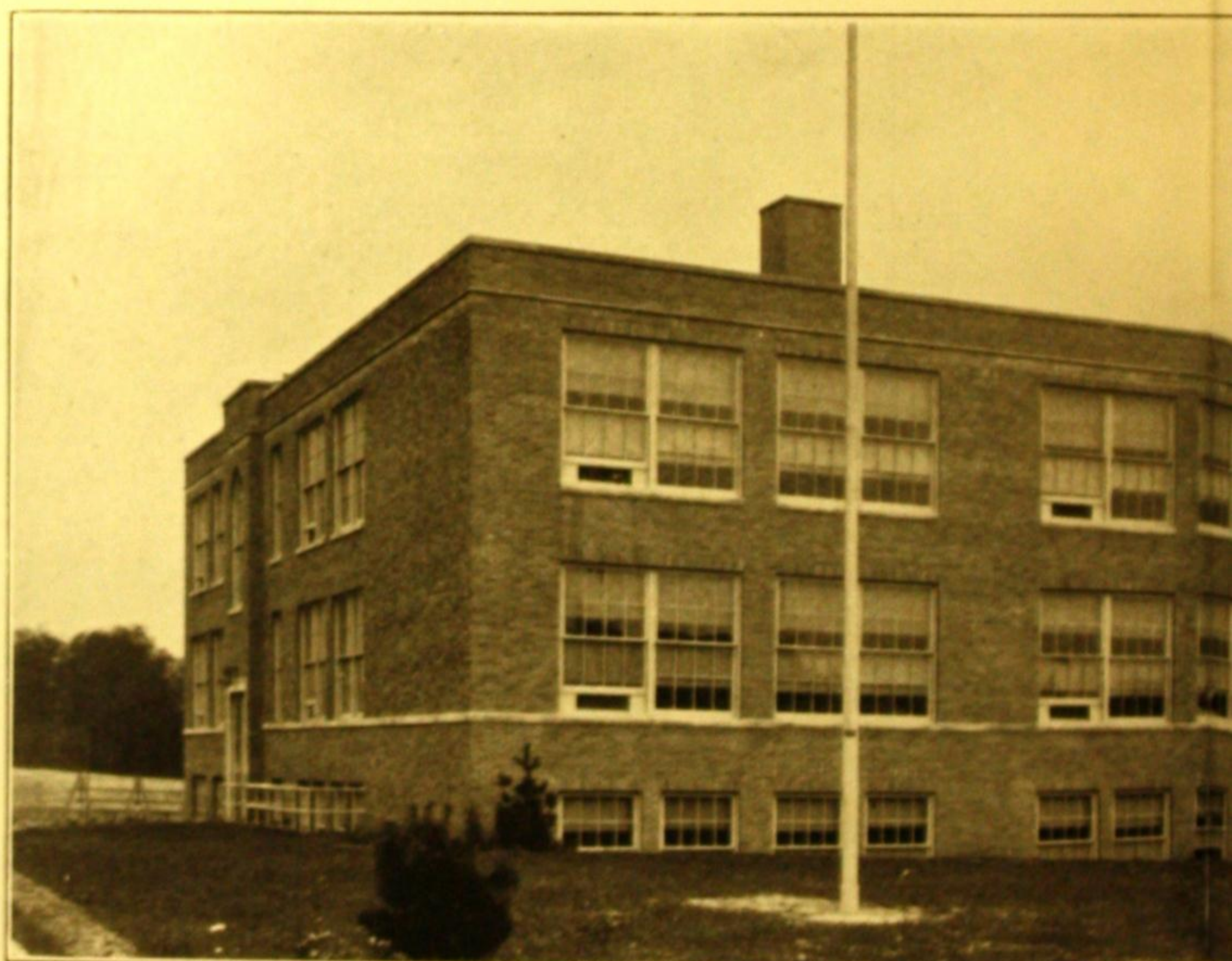
Heated by Two No. 120-34 Economy Smokeless Boilers; Midgeby Heating Co., plumbing and heating contractors; James J. Steer & Sons, plumbing architect.





GASTONIA HIGH SCHOOL,

Heated by Three 47-Inch Economy Smokeless Boilers, O'Pry Plumbing and Heating Company,

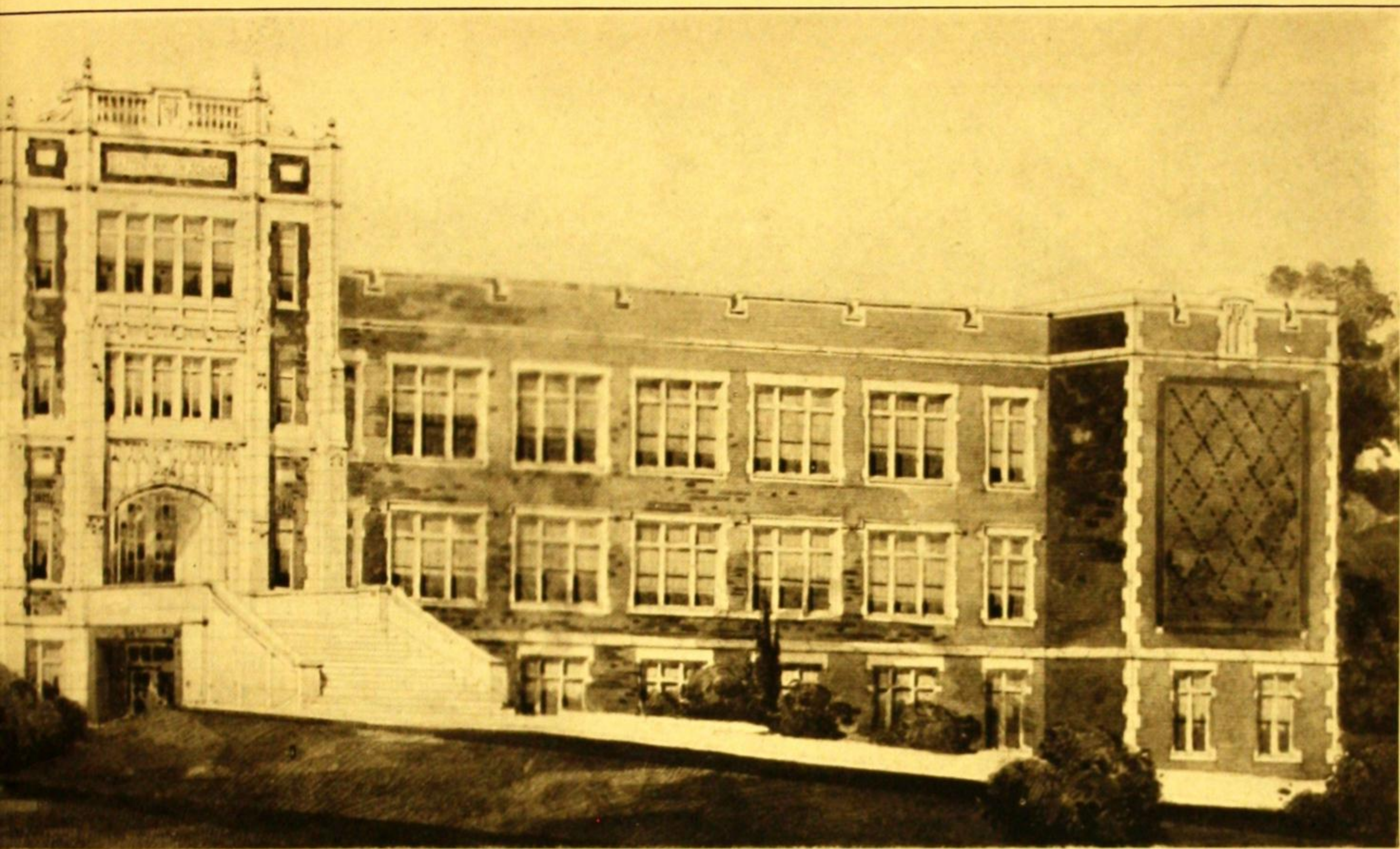


NEW HIGH SCHOOL,

Heated by Two 47-Inch Economy Smokeless Boilers, Harry F. Murphy Co., Inc., heating contractors,

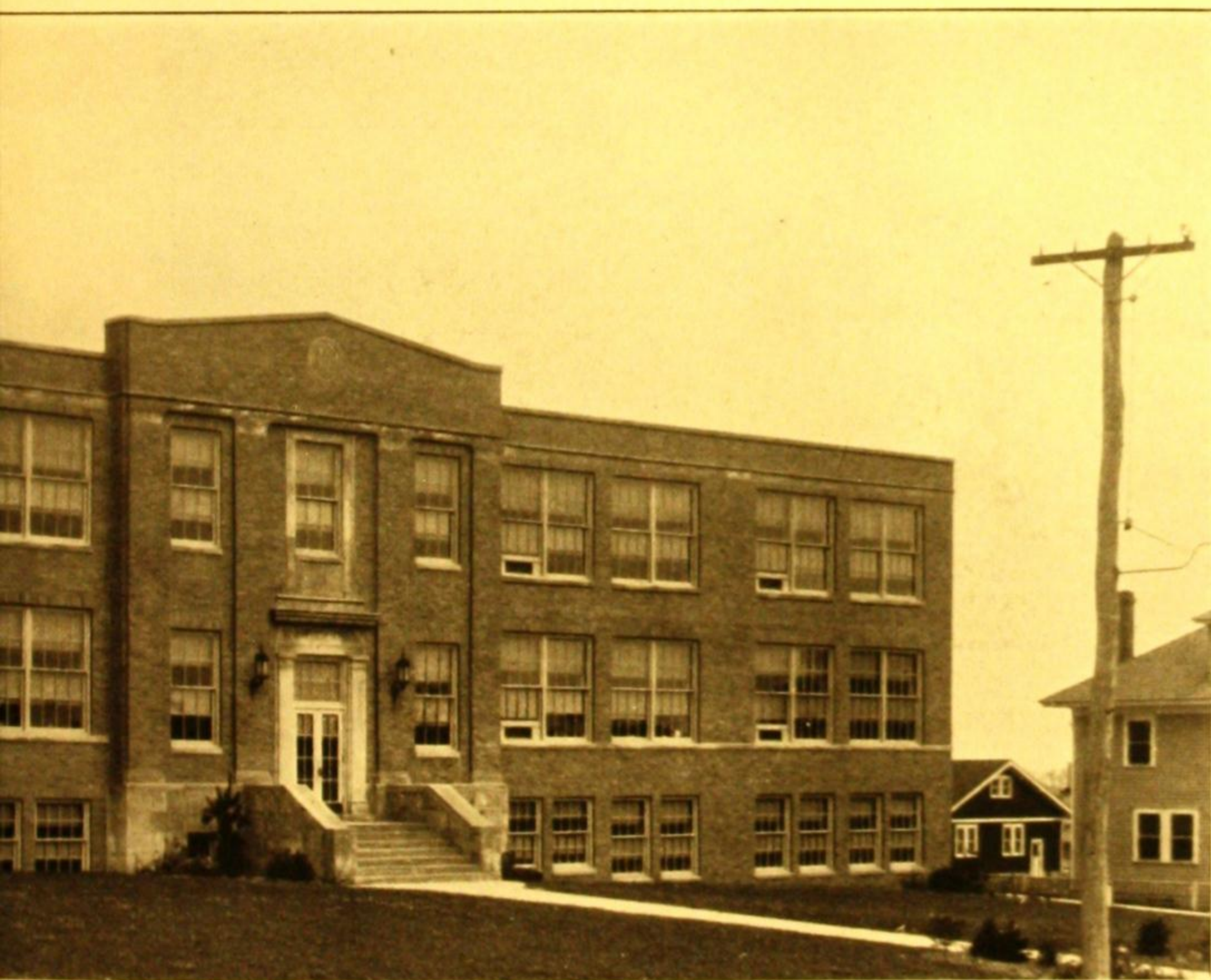


SMOKELESS BOILERS



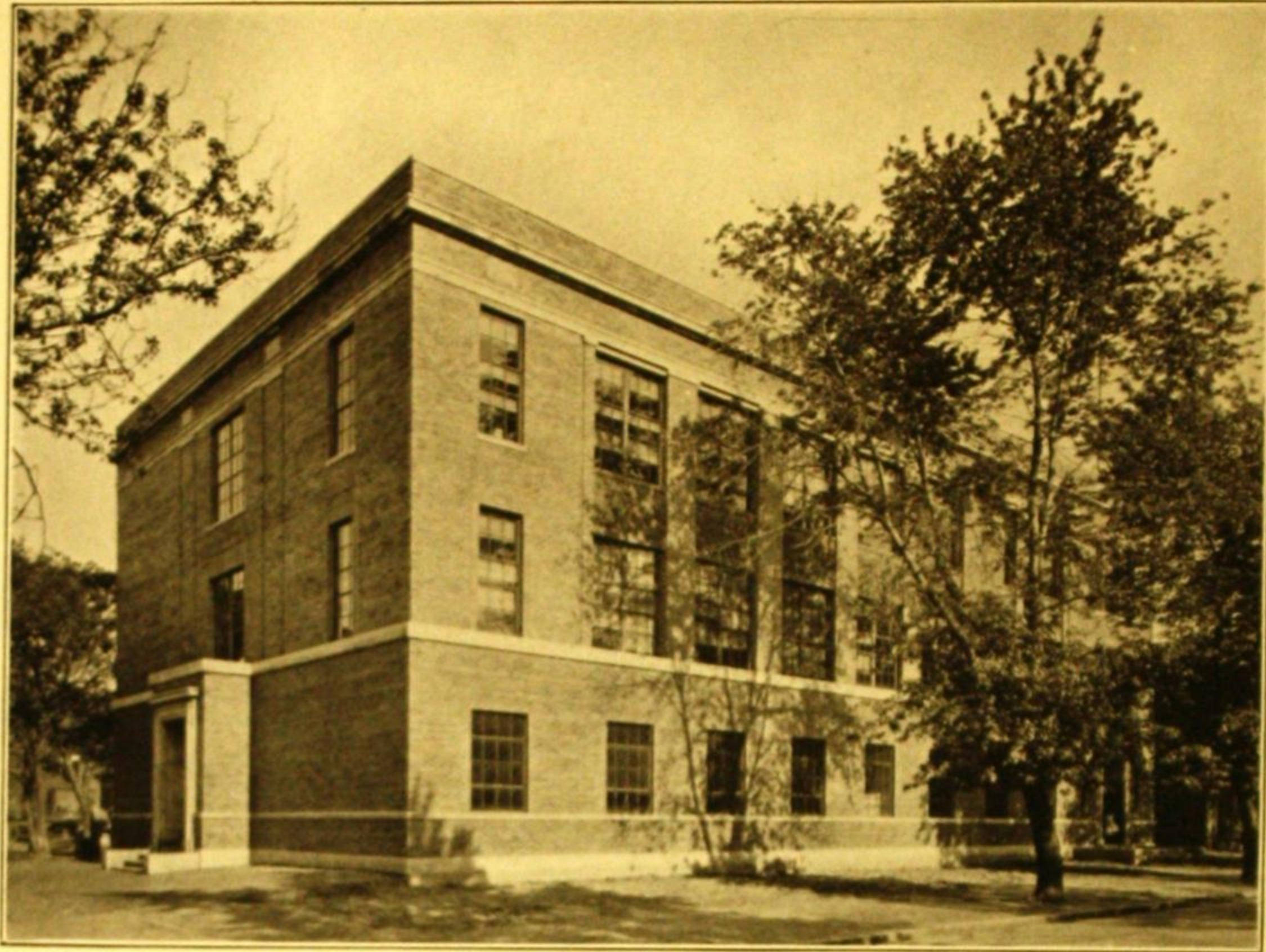
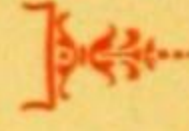
Gastonia, N. C.

heating contractors; White, Streeter and Chamberlain, architects; John A. Gardener, building contractor.



Pittman, N. J.

Philadelphia; Ritter & Shay, architects, Philadelphia; John J. Nesbit, Inc., engineers, Atlantic City, N. J.



**BELL
SCHOOL,
Washington,
D. C.**

Heated by One
No. 130-34
Economy
Smokeless
Boiler; A. L.
Harris, Washing-
ton, D. C.,
municipal archi-
tect; J. E. Land-
boigt, Washing-
ton, D. C., muni-
cipal engineer;
The Federal
Heating Co.,
Washington, D.
C., heating con-
tractors.

**LOVEJOY
SCHOOL,
Washington,
D. C.**

Heated by Two
No. 130-34
Economy
Smokeless
Boilers; A. L.
Harris, Washing-
ton, D. C., muni-
cipal architect;
T. E. Landboigt,
Washington, D.
C., municipal
engineer; M. B.
Casey & Co.,
Washington, D.
C., heating con-
tractors.





SMOKELESS BOILERS



MONROE SCHOOL, Columbia Road Washington, D. C.

Heated by Two
No. 130-47
Economy
Smokeless
Boilers; A. L.
Harris, Washing-
ton, D. C., muni-
cipal architect,
T. E. Land-
boigt, Washing-
ton, D. C.
municipal engi-
neer; Standard
Engineering Co.,
Washington, D.
C., heating con-
tractors.



ST. PAUL'S PAROCHIAL SCHOOL, V Street, Washington, D. C.

Heated by One
No. 100-47
Economy
Smokeless
Boiler; Mil-
burn, Heister
Co., Washington
D. C., architects;
G & H Heating
Co., Washing-
ton, D. C., heat-
ing contractors.



IVEY DEPARTMENT STORE, Charlotte, N. C.

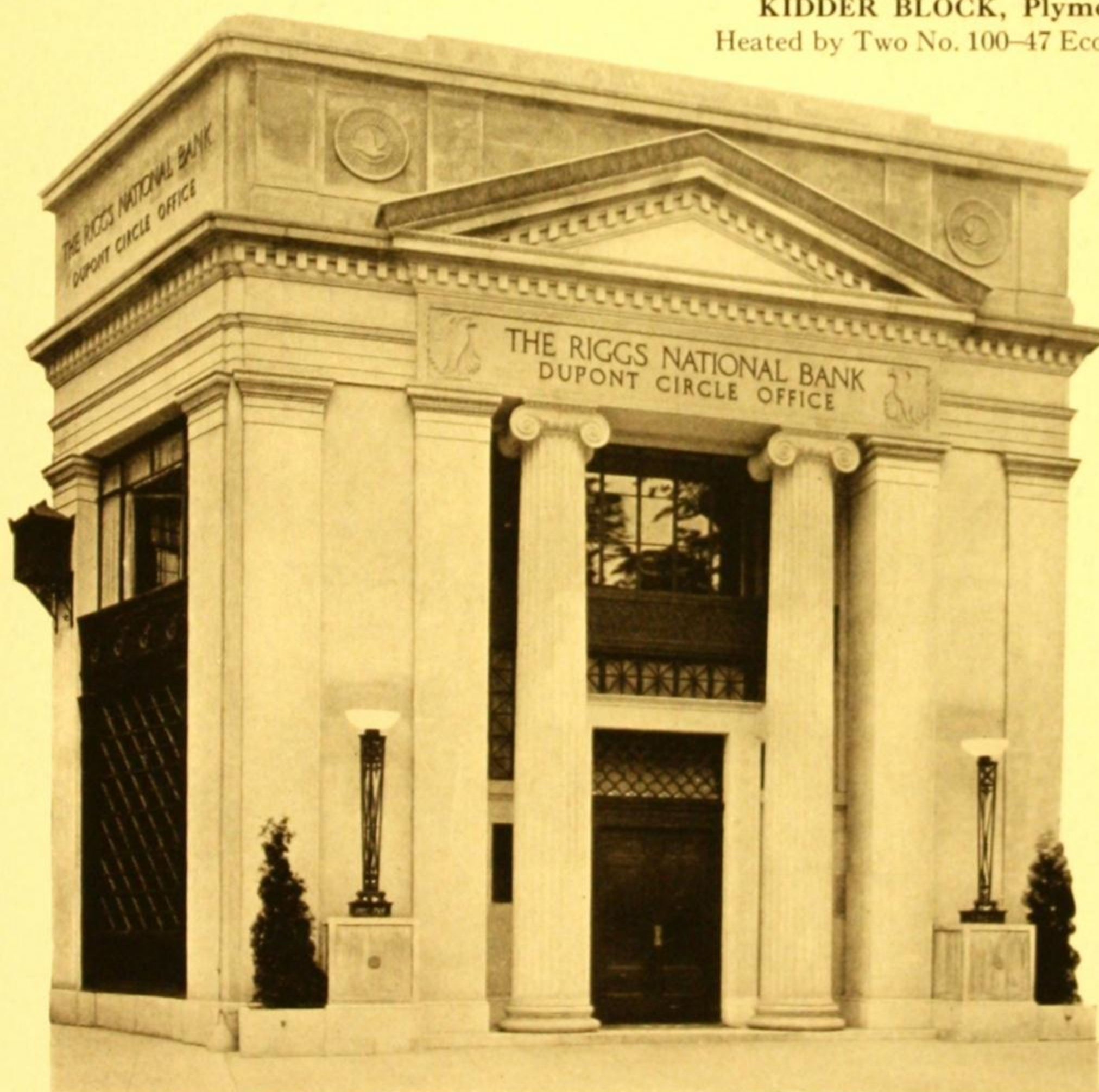
Heated by two No. 110-47 Economy Smokeless Boilers; W. H. Peepe, Charlotte, N. C., architect; A. Z. Price, Charlotte, N. C., heating contractor.



SMOKELESS BOILERS



KIDDER BLOCK, Plymouth, N. H.
Heated by Two No. 100-47 Economy Smokeless
Boilers.



RIGGS NATIONAL BANK, Dupont Circle Office, Dupont Circle, Washington, D. C.
Heated by One 38-Inch Economy Smokeless Boiler; Geo. M. Ray, architect; G & H Heating Co.,
Washington, heating contractors.



HIDE AND LEATHER BUILDING, New York City

Designed and Constructed by Thompson & Binger, Heated by Two 47-Inch Economy Smokeless Boilers,
installed by W. L. Fleisher & Co., Inc.

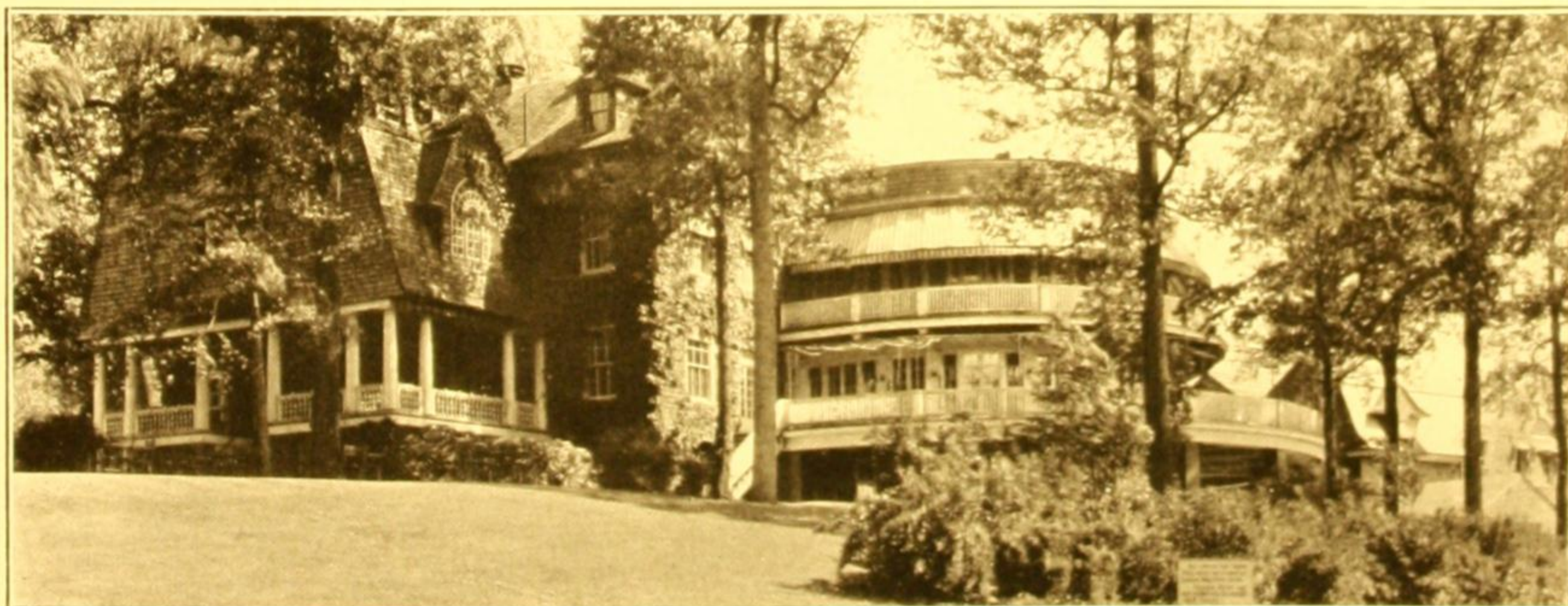
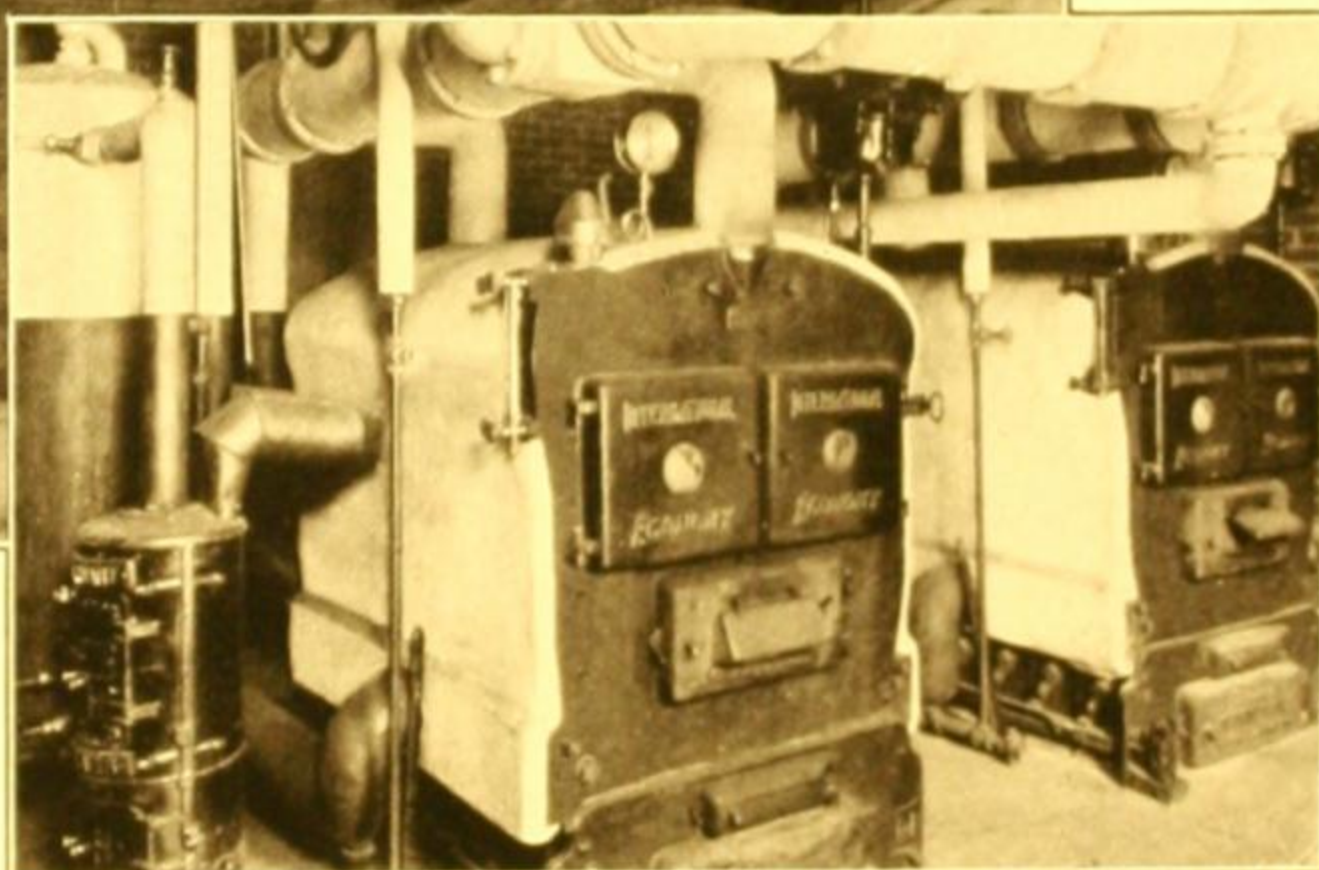


SMOKELESS BOILERS



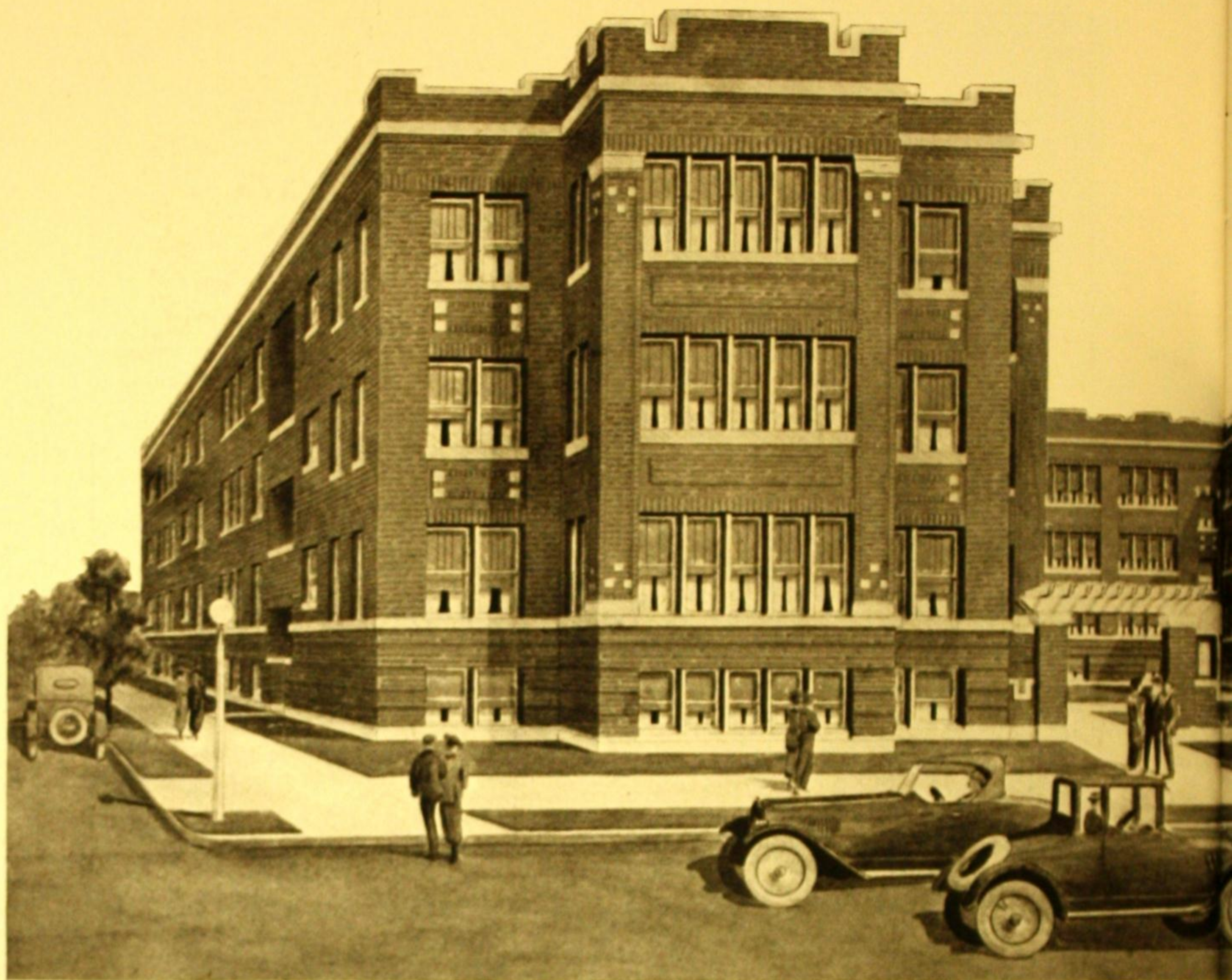
**BELL TELEPHONE BUILDING,
Braddock, Pa.**

Heated by Two No. 80-34 Economy Smokeless Boilers; Iron City Heating Company, Pittsburgh, heating contractors; John T. Windrim, Philadelphia, architect and engineer.



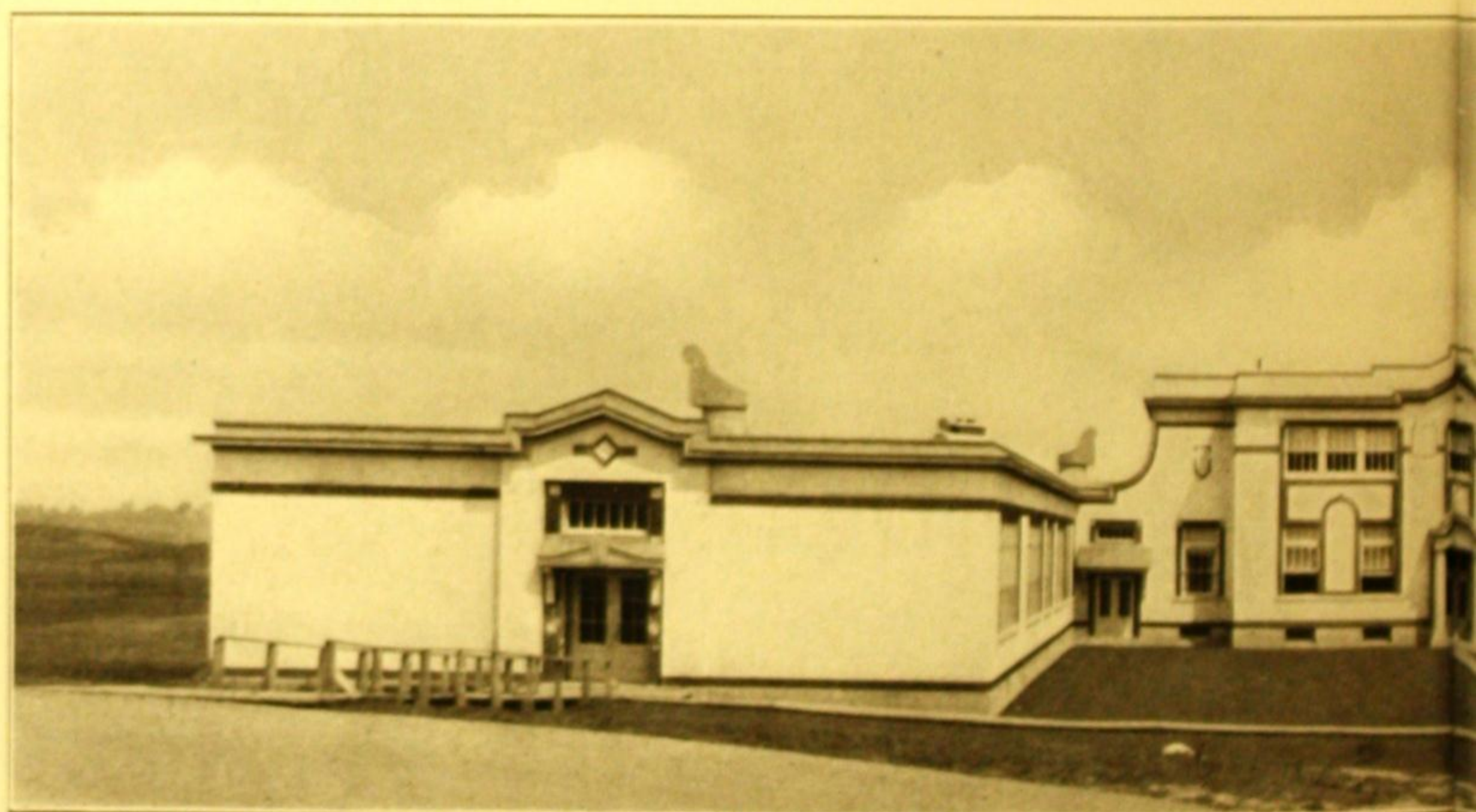
BALTIMORE COUNTRY CLUB, Baltimore, Md. (Roland Park)

Heated by Two No. 100-34 Economy Smokeless Boilers and One B244 Round Boiler used as a water supply Boiler; Francis C. Dorsey, heating contractor.



THE SWAN APARTMENT

John A. Chiaro, architect; Jos. F. Lovelle & Son, heating contractor

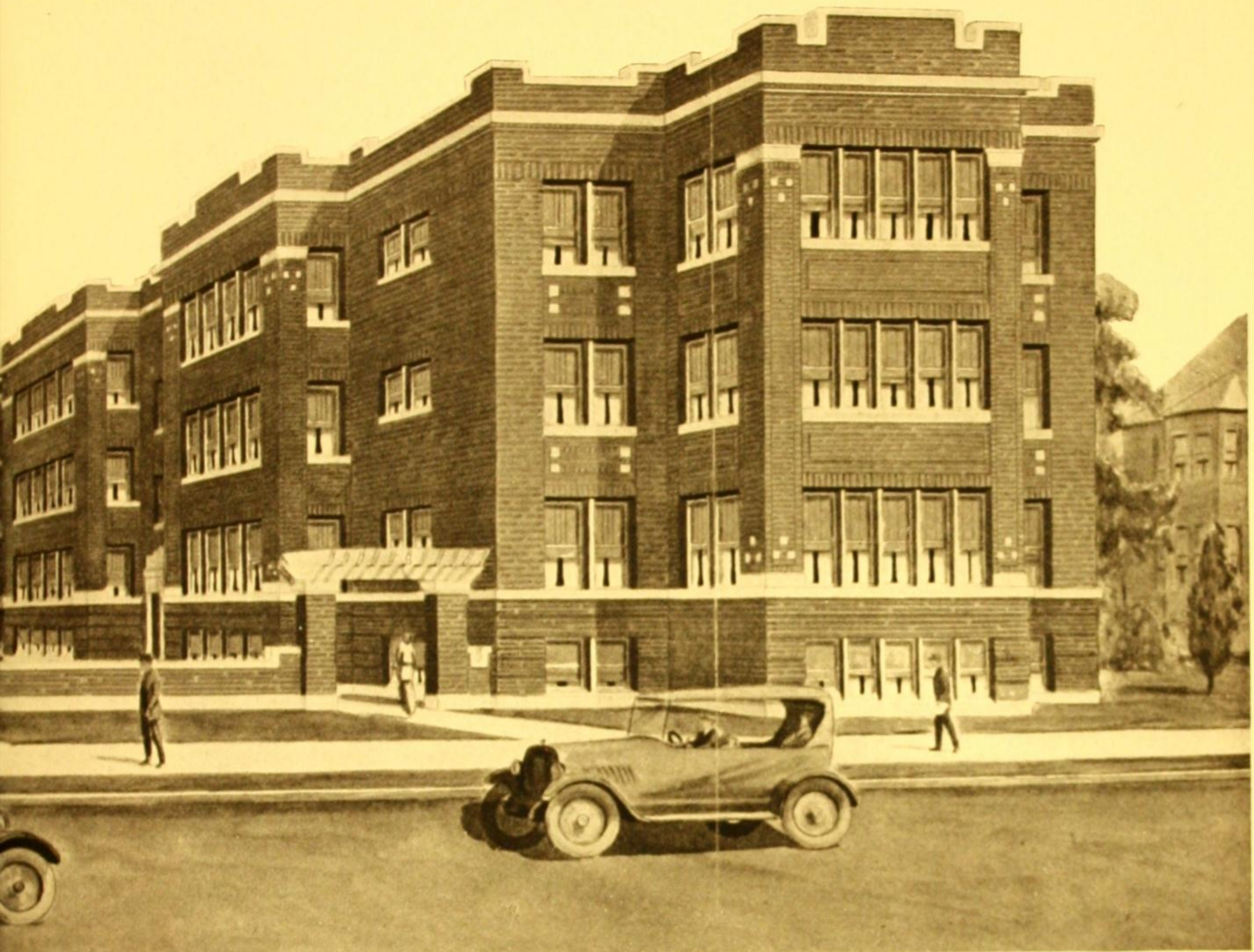


UTICA COUNTRY DAY

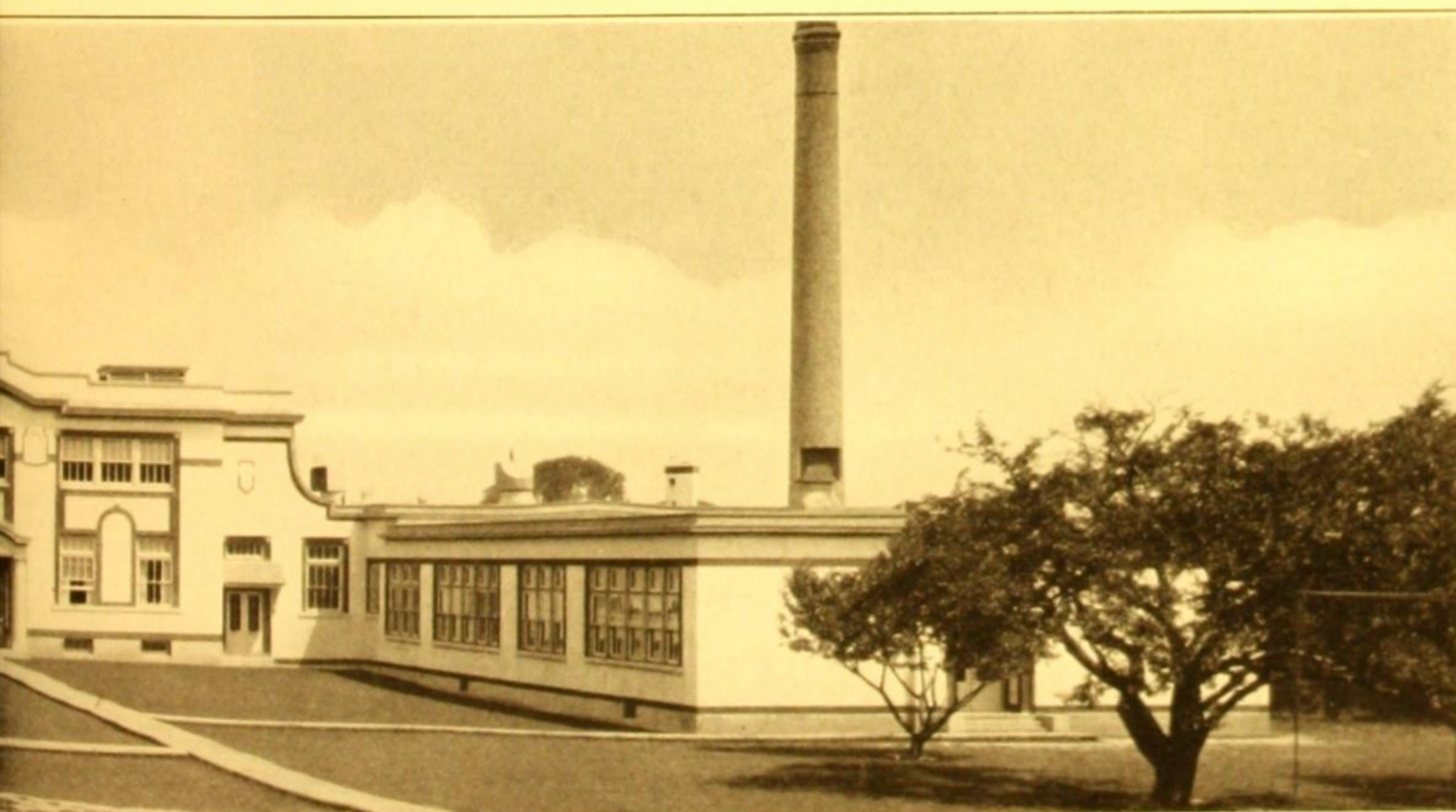
Heated by Three No. 140-47 Economy Smokeless Boilers installed by H. J. Brande



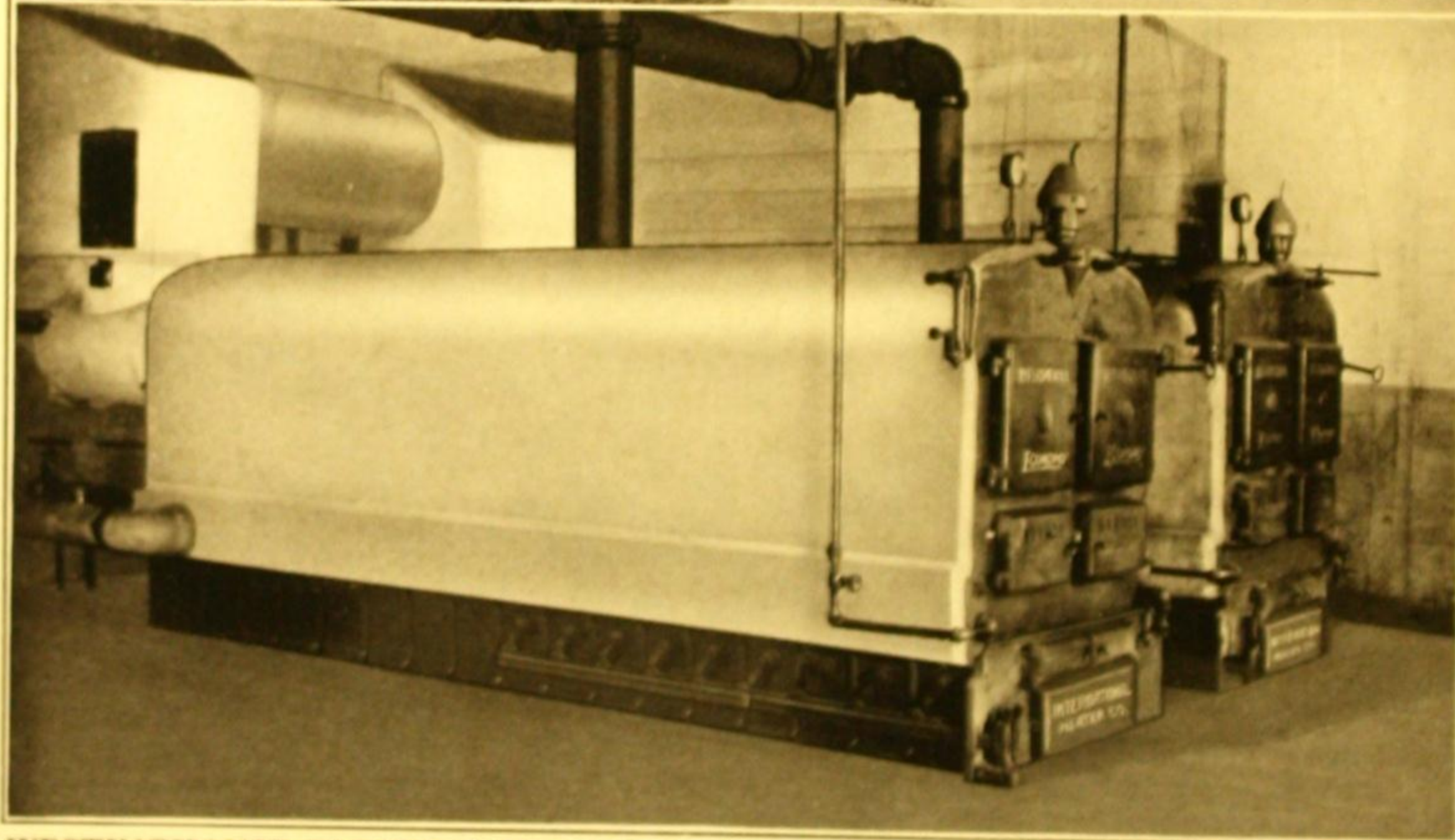
SMOKELESS BOILERS



BUILDING, Maywood, Ill.
Heated by Two No. 90-34 Economy Smokeless Boilers.



SCHOOL, New Hartford, N. Y.
Heated by Two No. 90-34 Economy Smokeless Boilers.
Boiler Corporation, Utica, N. Y. Architects, Pember & Campaign, Albany, N. Y.



WESTINGHOUSE ELECTRIC BUILDING, Thirtieth and Walnut Sts., Philadelphia, Pa.
Heated by Two No. 190-47 Economy Smokeless Boilers, W. G. Cornell Co., heating contractors;
Carson & Carson, designing engineers; Stewart A. Jellette Co., consulting engineers; C. J.
Mitchell Co. and Thomas B. Gibb, associated as financial agents.



SMOKELESS BOILERS



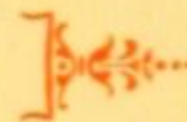
WELTMAN APARTMENTS, Cleveland, Ohio

Heated by Two 28-Inch Economy Smokeless Boilers; W. F. Hann, heating contractor,
Max Weiss, architect.



MIRAMAR APARTMENTS, Cleveland, Ohio

Heated by Two No. 140-47 Economy Smokeless Boilers, Connors Bros., heating contractor; J. Harold
MacDowell, architect; Clark, MacMiller & Riley Co., consulting engineers.



CONGRESS CIGAR BUILDING, Southwest Corner, Third and Spruce Sts., Philadelphia, Pa.

Heated by Two No. 210-47 Economy Smokeless Boilers, Radiation, 32,580 feet, Harry F. Murphy Company, Inc., heating contractors; John N. Gill Construction Company, general contractor; Isaac H. Francis, engineer; John N. Gill Construction Company, architect.

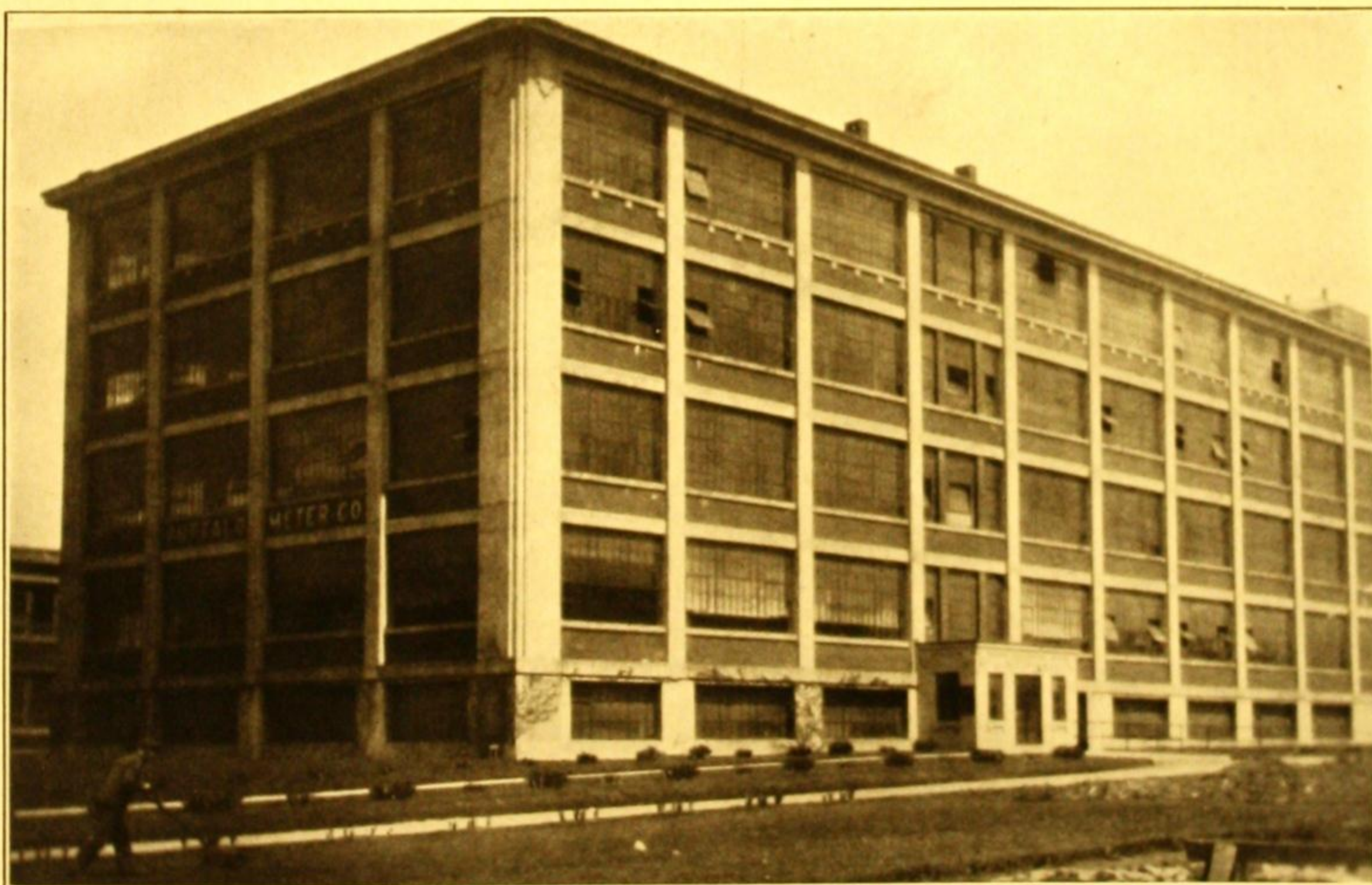


SMOKELESS BOILERS



KNIGHTS OF PYTHIAS CASTLE, Bryan, Ohio

Heated by One 34-Inch Economy Smokeless Boiler and One No. 80-28 Economy Smokeless Boiler,
Installed by Bryan Plumbing & Heating Company, Bryan, Ohio; M. M. & M. B. Stophlet, Toledo,
Ohio, architects.



BUFFALO METER COMPANY, Buffalo, N. Y.

Heated by Two No. 140-47 Economy Smokeless Boilers.



CENTRAL REFORMED CHURCH, Grand Rapids, Mich.

Heated by One 47-Inch Economy Smokeless Boiler, Installed by the Knee Heating Co., Grand Rapids, Mich.
The basement rooms and Pastor's study are warmed by One No. B244 Economy Water Boiler.



SMOKELESS BOILERS



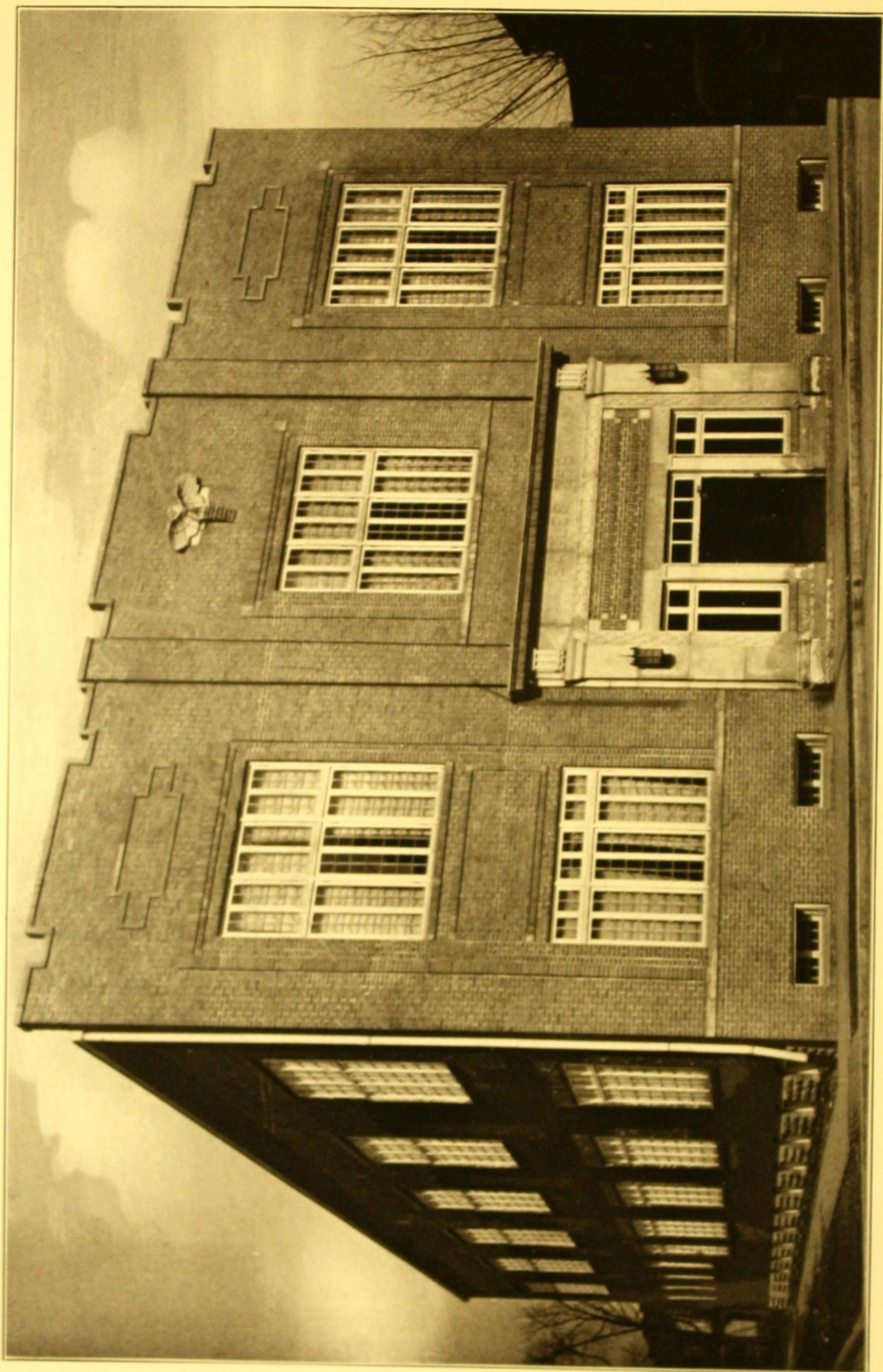
CHRIST METHODIST EPISCOPAL CHURCH, Glens Falls, N. Y.

Heated by One No. 110-47 Economy Smokeless Boiler. Installed by Albert G. Robinson, heating contractor, Glens Falls, N. Y.



BAPTIST CHURCH, Olean, N. Y.

Heated by One 28-Inch Economy Smokeless Boiler, Rogers Furnace Company, Olean, heating contractors; E. A. Phillips, Warren, Pa., architect; Peter Elling, general contractor.



NEW HOME OF PERU AERIE NO. 258 FRATERNAL ORDER OF EAGLES, Peru, Ind.
Jessie T. Osborn, engineer and architect, Peru, Ind.; Walter S. Lillard, heating contractor, Peru, Ind.; One No. 120-34 Economy Smokeless Boiler.

